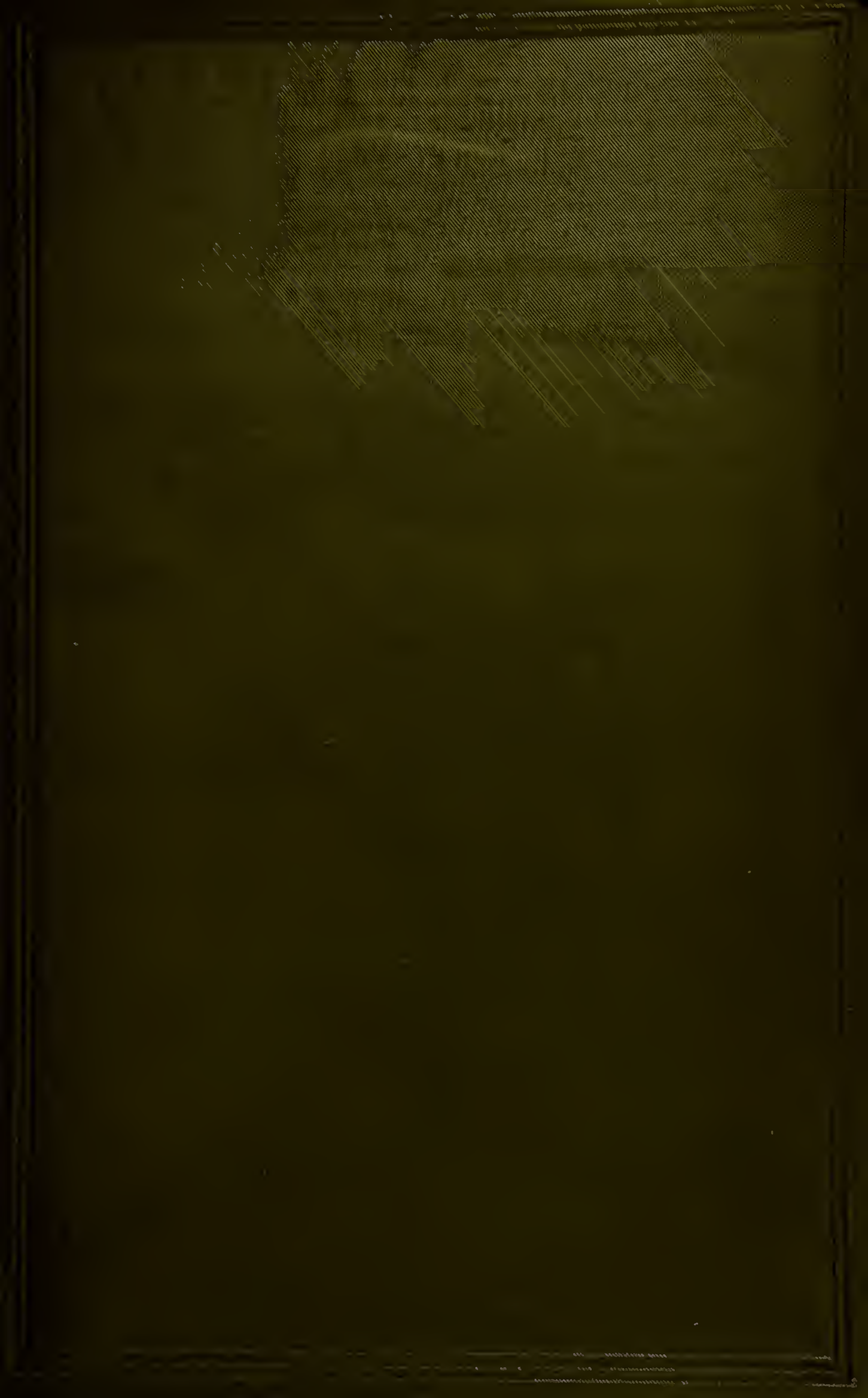

RENAL CASES

A SERIES OF SELECTED CLINICAL REPORTS AND SURGICAL STUDIES

By the Same Author—

Lectures to Practitioners on Surgical Diseases of the Kidney. Longmans, London. 1888.

Malignant Disease of the Throat and Nose. Young J. Pentland, Edinburgh. 1892.

Monograph on Malpositions of the Kidney. 1883.

Catalogue of the Pathological Museum of the Glasgow Royal Infirmary, 3rd Edition. 1889.

RENAL CASES

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SELECTED CLINICAL REPORTS AND SURGICAL STUDIES

BY

DAVID NEWMAN, M.D.
SURGEON TO THE GLASGOW ROYAL INFIRMARY

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MDCCCXCIX.

PREFACE.

This volume presents a series of renal cases selected from those observed in the wards of the Glasgow Royal Infirmary and in private practice. A list of the cases, along with short epitomes of their history, is given in place of a table of contents, and these will be found arranged according to the special points they are intended to illustrate.

28 Woodside Place,
Glasgow, *November*, *1899*.

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CLINICAL REPORTS AND STUDIES OF RENAL CASES.

Chapter I.

INCREASED VASCULAR TENSION IN THE KIDNEY A CAUSE OF RENAL PAIN, HÆMATURIA, AND ALBUMINURIA, WITH OR WITHOUT TUBE-CASTS; SYMPTOMS RELIEVED BY SURGICAL TREATMENT.

The causes of increased vascular tension in the kidney may be divided into two classes, namely, those that are chiefly mechanical, and those produced by some morbid process. The first four cases are brought forward to illustrate the way in which the circulation of the kidney may be interfered with by direct mechanical obstruction, while the remaining three show how the relief of tension due to morbid conditions may benefit the patient.

Torsion of the renal vessels and of the ureter may lead to one or more of the following symptoms, and the cases will illustrate the presence of these in various degrees:—

1. Dull aching pain in the renal region almost constantly present, and associated with occasional paroxysms of colic similar to that produced by calculus.

2. Hæmaturia, sometimes coincident with blood-casts in urine.

3. Albuminuria, with or without tube-casts in urine.

Case I.—*Movable Kidney, Enlarged and Hyperæmic from Torsion of Renal Vessels and Ureter, caused by Strain—Symptoms: Severe Paroxysmal Renal Pain, Hæmaturia, Gastric Disturbance, &c., simulating those of Renal Calculus—No Albuminuria independent of Blood—Operation—Cure.*

R. C., marine engineer, aged 40, consulted me in May, 1895. According to his statement, he first suffered from pain in the right side in 1891. This pain followed a severe strain in the lumbar region, caused by a sudden roll of the steamer, while patient was entering the man-hole of a boiler. The edge of the man-hole caught him just under the right ribs. Coincident with the attack of pain he noticed a quantity of blood in his urine, and the hæmaturia continued for several days, and then gradually disappeared. The pain in the lumbar region was so severe that he had to avoid work for over three weeks, and even after that time he required to be very careful not to over-exert himself, otherwise both the pain and the hæmaturia returned. This condition had continued during the last four years.

When seen by me he appeared a well-nourished man, but he said that the pain in the kidney was so constant that he was quite unfitted for his work at sea. The pain was generally dull, and sometimes only amounted to a sense of weight on the affected side. When he was at rest, he had little or no discomfort, but severe suffering was readily brought on by any sudden movement of the body. At first the pain was limited to the right renal region, and continued so for about two years, but when first seen by me it extended along the course of the ureter, to the perinæum and the testicle, and on rare occasions it passed over to the opposite renal region. Not infrequently the renal pain came on very suddenly, and was accompanied by very severe gastric disturbance, nausea and severe vomiting, faintness, and

gastrodynia. When the sickness passed off, the patient endeavoured to relieve himself by contortions of the body, and usually the pain subsided as suddenly as it commenced. Complete rest afforded marked relief to his suffering, and if he avoided active exercise of any kind, the pain and hæmaturia seldom troubled him.

The urine when free from blood was strictly normal, but when hæmaturia came on the blood was intimately mixed with the urine, to which it imparted a dark smoky-red colour, and the quantity of albumen present was in proportion to the hæmoglobin. No coagula, tube-casts, or histological elements of significance were found in the urine at any time. There was no suppression of urine, but during the attacks the urine was concentrated, and when these passed off the urine was dilute and copious. He was well-nourished, and the muscles highly developed, so that physical examination did not reveal the condition of the kidneys, nor did percussion give any satisfactory results. Pressure over the right renal region caused some pain.

I advised the patient to take six months' rest and then to report progress. In December, 1895, he consulted me again, and said that when he took complete rest he was free from pain, but if he used any liberty in the way of exercise he nearly always induced an attack of pain.

Considering all the facts of the case I advised him to have the right kidney explored; he consented, and the operation was performed at a private home in Glasgow on 17th January, 1896.

With the assistance of Dr. E. A. Gibson the kidney was exposed by a lumbar incision, and on opening the adipose capsule the right kidney was found not only to be movable but rotated, so that, even when the patient lay on his left side, the upper extremity of the organ pointed forwards. On

carrying the fingers round the fibrous capsule the fatty tunic was found to be only slightly adherent, and the pelvis was dilated to a moderate degree. The ureter was easily made out with the finger, and was found to be kinked over the renal vessels, and the kidney itself was observed to be enlarged, swollen, and engorged with venous blood. The fibrous capsule was exposed and incised along the outer border of the kidney, stripped off the cortex for a third of an inch all round the incision, and sutured to the parietes.

When the fibrous capsule was incised the soft cortical substance of the kidney pouted through the incision, and on separating the capsule free bleeding occurred. The superabundant fat was also removed, and the remaining adipose capsule was sutured to the muscular wall in such a way as to fix the kidney as high up as possible, and so as to maintain the normal relationship of the ureter and renal vessels. A large rubber tube was inserted along the depth of the wound in order to promote adhesions.

The patient made a good recovery, and since the operation he has had no return of the symptoms.

He reported himself in perfect health on the 28th October, 1896, having followed his occupation at sea since the beginning of March.

Case II.—*Severe Paroxysmal Renal Pain and Hæmaturia without Gastric Disturbance—Occasionally Blood-casts in Urine, frequently Tube-casts, and sometimes Albumen independent of Blood—Movable Displaced Kidney—Cured by Operation.*

T. L., aged 50, an ironmoulder, was sent by Dr. John Service, of Mossend, to the Royal Infirmary, 30th January, 1893, complaining of severe pain in the region of the left kidney shooting downwards and forwards in front of the

abdomen. These paroxysms of pain usually came on after exercise and lasted for several minutes at a time, while during the six months prior to admission he almost constantly suffered from an aching pain in the left side. At the onset of the attacks of paroxysmal pain the urine was of a dark red colour, and contained a large quantity of blood, but gradually the quantity of blood diminished, and the urine became bright red.

The patient was a very well nourished man, short in stature, weighed 14¼ st., and very stout, so that examination of the renal region with the hand did not reveal anything; even firm pressure applied to the part did not give pain, and no increased muscular resistance could be made out. During residence in hospital the patient was kept strictly in bed, and from 30th January till 6th March he only complained of the dull aching pain: he had no paroxysmal attacks, and no hæmaturia or albuminuria. He was readmitted on the 8th of May, 1893, having suffered from several attacks since he left the hospital in March.

During all these acute attacks the pain was not limited to the loin, but extended down the left ureter, to the testicle, to the inner aspect of the thigh, and sometimes even to the hip. Frequently a change in position modified the pain, but marked relief to suffering was afforded only by complete rest in bed, and to this the patient had often to resort.

On the 10th May, the following note was made:—"Until the present time the symptoms all pointed to the presence of a stone in the left kidney. The pain was clearly increased by exercise and relieved by rest, and so also was the hæmaturia. Yesterday he had an attack of renal colic and hæmaturia, and the following is a note of the condition and quantity of the urine:—

1893.	Ounces of Urine.	Remarks.
May 9, 6 P.M.,	12	Urine clear; trace of albumen; a few tube-casts. No pain. Sp. gr., 1013.
,, 10 P.M.,	4	Pale urine. Sp. gr., 1020.
,, 11 P.M.,	...	Severe paroxysm of pain in left side.
May 10, 5 A.M.,	6	Urine dark porter colour. Sp. gr., 1024. Blood abundant. Blood-casts. Pain still continues severe.
,, 8 A.M.,	18	Pale red blood-stained urine. Sp. gr., 1008. Pain gone.
,, 12 Noon,	15	Trace of blood only. Small quantity of albumen. Sp. gr., 1011.
,, 7 P.M.,	9	Clear urine. Sp. gr., 1015. No albumen; no tube-casts.

The presence of blood-casts in the urine suggests the source of hæmorrhage as being in the renal substance rather than the consequence of a calculus in the pelvis of the kidney. It must be remembered, however, as pointed out by Dr. James Finlayson in a paper on the occurrence of tube-casts in non-albuminous urine,[1] that tube-casts are found in the urine in cases of renal calculus and gravel, with complete absence of albumen in cases free from nephritis.

19th May, 1893.—The patient remained well, and since 8 A.M. on the 10th inst. there has been no pain, and no blood, tube-casts, or albumen since 7 P.M. on the same day.

The presence of blood-casts in the urine was observed for the first time on the 10th of May, and gave quite a new aspect to the hæmaturia, which prior to this time was regarded as due to the presence of a stone in the left kidney.

The patient remained well till the 1st June, when he left the ward, not having had any recurrence of pain or of hæmaturia.

Readmitted 22nd June, 1896.—Since leaving the hospital in June, 1893, the patient has suffered more or less pain in

[1] *British and Foreign Medico-Chirurgical Review*, 1876.

the region of the left kidney, which is increased by exercise and relieved by rest in bed. The pains and the hæmaturia present the same characteristics as formerly, but now there is considerable tenderness on palpation at a spot midway between the crest of the ilium and the last rib on the left side. On account of the stoutness of the patient palpation fails to reveal the condition of the left kidney.

Considering that rest in bed only gave temporary relief, and that the patient was incapacitated from following his occupation by the frequency of the attacks, he was advised to submit to an operation for the purpose of ascertaining the precise condition of the left kidney, and if possible of relieving it permanently.

On the 29th June an incision was made down to the left kidney, when it was found to be moderately movable, displaced upwards and forwards, and rotated on its short axis, so that the lower margin of the organ pointed forwards.

The adipose capsule was freely separated from the fibrous covering of the kidney, and a considerable portion of the loose fat removed. The fibrous capsule was then incised, stripped off the cortex for half on inch on either side of the incision, and stitched to the parietes. A large drainage-tube was inserted, and the deep parts of the wound kept open for ten days, after which it was allowed to heal.

In this case the symptoms—viz., paroxysmal renal pain increased by exercise and relieved by rest; hæmaturia, tenderness on palpation in the left renal region—all pointed to calculus in the kidney, but the presence of a few tube-casts, traces of albumen, without pus or blood, indicated that the morbid condition affected the tissue of the kidney, while the occasional appearance of blood-casts pointed to the origin of the hæmorrhage. At the operation a sufficient explanation was found. The rotation of the kidney, so that

the lower margin presented forwards, must have caused the ureter and blood-vessels to be coiled round one another, and so impeded the circulation of blood. As a consequence, more or less severe passive hyperæmia was produced, varied in degree according to the precise position occupied by the kidney at different times.

The patient reported himself on 2nd November, 1896, and stated that while occasionally he has had slight pain in the cicatrix, he has had no return of the old renal pain, nor has any blood appeared in the urine. A specimen of urine examined was free from albumen and tube-casts.

Case III.—*Movable Kidney caused by Fall—Symptoms: Severe Paroxysmal Renal Pain, Sickness, and Vomiting—No History of Hæmaturia; Urine Normal between Attacks of Colic—Operation; Kidney Enlarged and Engorged with Blood—Cure.*

A. B., aged 53, was sent to me by Dr. George S. Middleton, of Glasgow, whom he consulted along with his family attendant, Dr. James Laurie, of Greenock, in June, 1896, with the history that up till five years ago he enjoyed perfect health. One night he was called suddenly, and while running on deck he tripped over a hawser and fell very heavily on his right side, and was conscious at the time of having "twisted himself." The pain in the right lumbar region, which followed the accident, was severe, and after lasting for a fortnight or so gradually improved, but did not entirely disappear. From the time of the injury till two years ago the patient has always noticed that, if he lay in bed upon his left side, on rising in the morning he suffered from a dull aching pain in the right lumbar region, which only became relieved when he walked about for a quarter of an hour or twenty minutes.

Till the summer of 1894 this condition of matters continued, but about that time the pain became much more severe, the attacks were more frequent and often lasted the greater part of the day, and did not readily disappear on walking about. In 1895, while at San Francisco, he was seized with a severe paroxysm of pain, which came on suddenly in the right renal region and extended down the groin and to the testicle, and was accompanied by severe sickness, sweating, and vomiting. After this first attack, which, from his description, resembled renal colic, he had several others, and the longest interval between them was two months. Between the paroxysms of acute pain he suffered more or less from the old dull pain in the right renal region. In March, 1896, while in Hull, he suffered from a very severe attack which lasted for over eight hours. This was the last previous to the operation, but they had become so frequent and severe that he was determined to have something done for his relief.

When examined, the patient was found to be a very well nourished healthy-looking man, the muscular development being so good that little could be made out by palpation further than that the muscular resistance was much greater in the right than in the left lumbar region, and pressure over the right kidney caused considerable pain.

The urine was at all times strictly normal when I examined it, but I had no opportunity of seeing it during a severe attack.

I advised an exploration by lumbar incision, to which he consented, and the operation was performed in a private home in Glasgow, in July, 1896.

On exposing the right kidney the cortex was found to be deeply injected with blood; the organ was enlarged and moderately movable. In separating the adipose tunic several large veins were torn, but no torsion of the ureter or vessels

could be made out. A considerable portion of the adipose capsule was removed, and in all respects the operation was performed in the same way as in Case I.

The patient made a good recovery, and on 3rd November, 1896, reported himself perfectly well since the operation.

CASE IV.—*History of Injury causing Movable Kidney, Renal Pain. Emaciation, and occasional Suppression of Urine from Torsion of Artery and Ureter—No Tube-casts, Hæmaturia or Albuminuria—Cured by Operation.*

N. O., aged 49, came under observation in 1882. Prior to this the patient, who was at one time very stout, had been emaciating. He had suffered a good deal from chronic bronchial catarrh, attended with considerable muco-purulent expectoration which, on microscopic examination, was found occasionally to contain a few blood-corpuscles and a considerable quantity of pus. The physical signs were indicative of chronic bronchitis accompanied by slight emphysema, without bronchiectasis.

The history of the case, as far as the movement of the kidney is concerned, dates from the beginning of the year 1882. He was out riding one day, when his horse stumbled, and he fell on his right side and fractured two of his ribs (the ninth and tenth left). He was kept in bed for a fortnight after the accident. During this time he complained of pain on the right side, immediately below the edge of the liver. The practitioner attending him at that time suspected an abscess, and treated him accordingly. While he remained in bed he did not notice any swelling or tumour on the right side, but after he got up he discovered a movable tumour seated in the hypochondriac region. At first he complained of pain in the right renal region, attended with vomiting and sometimes followed by diarrhœa.

The pain usually came on suddenly and lasted for five or six hours. He noticed that if he took much exercise, or if the bowels were constipated, he was more apt to have an attack. When he took to bed the symptoms soon disappeared, but, on the other hand, if he continued to take even moderate exercise the pain caused him considerable inconvenience.

He was greatly emaciated, and for a man the belly was loose and pendulous. Palpation of the abdomen revealed the presence of an oval swelling immediately under the lower edge of the liver, and about 2 inches from the umbilicus. The swelling could be freely moved about in the abdomen, and pushed down into the pelvis, upwards under the edge of the liver, and an inch to the left of the middle line. Percussion over the right renal region or over the swelling did not yield any satisfactory results, but when the right loin was examined, the kidney having previously been displaced, a distinct flattening could be made out. When the swelling was handled a sickening sensation was experienced, resembling, as the patient informed me, the pain produced when the testicle is squeezed.

A careful examination was made with the object of detecting pulsation of the kidney or of the renal artery, as this case appeared to be a very favourable one for this purpose on account of the thinness and looseness of the abdominal wall, but no trace of movements resembling pulsation could be made out.

The only other symptom worthy of notice was the occasional sudden suppression of urine, without any very evident cause, and without any apparent relation to the position of the right kidney. Sometimes it commenced without the organ being displaced, at least, so far as could be detected by hand, and there was no increase in the size of the organ during the time this symptom was present.

The only explanation I can give for the scanty secretion of urine, is to suppose that the kidney was rotated on its short axis, so that the ureter and blood-vessels were coiled round one another, and the passage of blood to and from the kidney was thereby prevented. This condition would lead to a very marked engorgement of the kidney on the affected side, while it might also induce reflex spasm of the blood-vessels in the opposite organ, and so bring on suppression, just as the use of a catheter may cause the excretion to cease for a time.

When the secretion again became active, the urine passed did not differ from what was voided at other times.

The following table will show the quantities and specific gravities of seven samples collected during one of the attacks. There was no urine passed between 11 A.M. on the 28th and 1 A.M. on the 29th of November:—

1882.	Quantity.	Sp. gr.	Urea.	Remarks.
Nov. 28, 7 A.M.,	10 oz.	1015	1·75 p. cent.	Slight deposit of urates.
,, 11 A.M.,	8 ,,	1017	1·85 ,,	Do.
Nov. 29, 1 A.M.,	3 ,,	1016	1·7 ,,	Considerable deposit of urates.
,, 3 A.M.,	10 ,,	1019	1·9 ,,	Do.
,, 8 A.M.,	6 ,,	1014	1·5 ,,	No deposit.
,, 1 P.M.,	7½ ,,	1014	1·55 ,,	Do.
,, 5 P.M.,	10 ,,	1018	1·7 ,,	Do.

At the time the case was considered to be one of movable kidney, with torsion of the renal artery, without much obstruction to the venous return, as shown by the sudden suppression of urine, unassociated with hæmaturia, albuminuria, or the presence of tube-casts.

The patient refused to have an operation performed, and at the time (1882) I was too uncertain in my views of the case to press the matter. But the symptoms remaining

unabated till 1888, I then performed nephrorraphy with a good result.

In the three cases first described, some of them under observation for a considerable period, the first diagnosis formed was that of renal calculus. The paroxysmal pain increased by exercise and relieved by rest in bed, the hæmaturia in the first two cases and the general gastric disturbance in all, were similar in character and mode of onset to what is observed in calculous disease of the kidney. But in these cases, in addition to and coincident with the symptoms just mentioned, there was sudden diminution in the quantity of urine, while the subsidence of the renal pain was soon, but not immediately, followed by a copious flow of urine of high specific gravity, instead of low as in transitory hydronephrosis. The hæmaturia associated with blood-casts in the urine, and the renal pain concurrent with the sudden appearance of albumen and tube-casts, are important circumstances in forming a diagnosis.

From these cases it is evident that when the kidney becomes displaced the vessels, the nerves, and the ureter may become so twisted together that the circulation of blood is seriously interfered with for the time being. In Case I the kidney was found to be displaced at the time of operating, and the ureter kinked over the renal vessels, while the kidney itself was seen to be greatly engorged with venous blood. In the fourth case evidently the arterial circulation alone was interfered with.

Mechanical obstruction may lead to very marked vascular tension in the kidney, which tension may be revealed clinically by the presence not only of albumen but also of tube-casts in the urine.

Three cases will be considered further on in which

the symptoms pointed to torsion of the renal vein as well as of the ureter, causing not only hydronephrosis, but also considerable albuminuria and the presence of tube-casts (Cases VIII, X, and XI).

All the cases referred to above seem to have an important bearing, not only upon the pathology of albuminuria, but also on the treatment of it in certain cases.

Interference with the venous flow produces two changes in the urine—(1) a diminution in the quantity and (2) the passage of albumen and the corpuscular elements of the blood.

The pathology of these cases must be discussed separately from those that are to follow, as the conditions appear to be entirely different.

It is manifest that in such displacements of the kidney as those described, we have to deal with a passive hyperæmia of the kidney due to local causes. In some instances the obstruction may be entirely venous, in others the arterial circulation may also be interfered with, either as a consequence of direct pressure or from spasm of the vessel's wall. It has been proved by experiments upon animals that when the venous flow is impeded, the quantity of blood flowing through the kidney is diminished, and as a consequence the amount of urine excreted immediately decreases. Coincident with the diminution in quantity of the excretion there is a concentration of the urine, which soon becomes albuminous also, and should the hyperæmia be intense, blood corpuscles, tube-casts, or even blood-casts may appear in the urine.

When the efferent resistance is made greater from any cause, the veins and the venous radicles surrounding the uriniferous tubules will become distended; this increased resistance to the flow of blood will lead to an augmentation of the blood-pressure within the glomeruli, but at the same time, by diminishing the total quantity of blood flowing

through the organ, the venous obstruction will cause retardation to the excretion of urine.

The absolute pressure of the blood in the glomeruli is only one factor in determining the quantity of urine excreted; the rapidity of the flow is even of greater importance, and the kidney being provided with a rigid capsule the engorgement of the veins must produce considerable pressure upon the uriniferous tubules, and so augment the pressure of the fluid in Bowman's capsules. This compensates to some extent for the increased tension of the blood in the Malpighian tufts.

The backward fluid pressure of the urine so produced doubtless induces an œdema of the organ, and probably a partial absorption of the already secreted urine, as indicated by an engorgement of the lymphatic spaces, but when the obstruction to the vein is removed the venous radicles empty themselves quickly, and the œdema rapidly disappears.

As regards the passage of albumen and the corpuscular elements of the blood, long ago Mr. George Robinson, in a paper read before the Royal Medical and Chirurgical Society of London in 1843, demonstrated by experiments upon animals that obstruction to the renal vein caused both albuminuria and hæmaturia, and these abnormal constituents appeared in the urine within a very short time after the obstruction took place, in some instances within three or four minutes. Senator also by experiments proved that by obstructing the renal vein for a short time in a living animal, albumen and blood corpuscles could be easily detected in the straight tubules, while Bowman's capsules were free; but if the pressure were more prolonged, the mechanical hyperæmia caused blood to escape into the Malpighian capsules also.

From these experiments it is easily seen how blood-casts, blood corpuscles, and albumen may appear in the urine in the

cases described above, and from other observations it has been shown that the slower the circulation becomes the larger will be the amount of abnormal constituents in the urine.

Not only does venous obstruction produce those changes in the urine, but compression of the renal artery may also be followed by suppression of the excretion. Hermann and Overbeck demonstrated that even slight disturbance of the renal circulation causes suppression, which may last for a longer or shorter period according to the sensitiveness of the individual, and that albumen and blood may appear in the urine for hours or days thereafter. We also know that arterial obstruction is an important cause of venous hyperæmia, and with the possibility of having venous pressure combined with arterial disturbance of the circulation we have in movable kidney a most productive cause of suppression of urine followed by hæmaturia and albuminuria.

I believe that not only in the cases referred to here, but in many others the retardation of the glomerular circulation by venous engorgement is the chief factor in the causation of suppression of urine and some forms of albuminuria; and, consequently, relief of tension may give immediate ease to the patient and restore the function of the kidneys.

General experience, I think, has shown that the vascular tension produced by mechanical venous obstruction or by inflammatory engorgement cannot be relieved permanently by drugs, while it can be rapidly alleviated and serious consequences avoided by surgical treatment. Free incision or local bleeding is clearly indicated in such cases; and in all cases of increased vascular tension of a tissue, whether the one or the other method should be employed depends upon the immediate cause of the tension and the anatomical structure of the organ or part involved.

The attention of the profession has been directed to the subject of "albuminuria associated with kidney tension" by a very interesting and admirable paper published in the columns of the *Lancet* on the 4th of January of this year, by Mr. Reginald Harrison, and also by his address as President of the Medical Society of London, 12th October, 1896. In his first contribution he makes the following observation:—"Since the introduction and the more general adoption of direct exploration of the kidney through an incision from the loin, or otherwise, a certain proportion of cases have been met with where it failed to reveal any obvious cause for the symptom or symptoms which led to the adoption of the proceeding. It has, however, been frequently noticed that such cases are often completely and permanently cured by what was done." He then cites three cases in illustration. The first, an instance of post-scarlatinal nephritis; the second, a nephritis from exposure to cold and damp; and the third case, one of sub-acute nephritis following influenza, and in all of these he believed that considerable benefit was derived from the relief of renal tension by incision of the kidney. The details of the cases are not sufficiently complete for the reader to form an independent opinion from the facts stated, but from what I have seen of other cases I am willing to admit the justness of Mr. Harrison's conclusions as applied to the effects of increased vascular tension on the kidneys and their excretions.

In corroboration of Mr. Harrison's view that inflammatory hyperæmia may lead to considerable pain in the kidney accompanied by albuminuria, and relieved by incision, the following cases may be quoted:—

Case V.—*Sudden Suppression of Urine, Albuminuria, Renal Colic —Incision of Kidney Followed by Relief of Pain, and Disappearance of Albuminuria.*

In 1888, at the Western Infirmary, I saw a man who complained of severe pain in the loins, more severe, however, on the right side. It came on suddenly about two months previously, and at the onset was accompanied by rigors and a sudden diminution in the quantity of urine.

I ascertained from his medical attendant, the late Dr. John Moyes, of Largs, that the urine at the beginning of the attack contained albumen, but no tube-casts were discovered. Specific gravity, 1025 to 1030; but daily quantity of urea was diminished. Urine passed from 25 to 35 oz. in twenty-four hours. The patient did not complain of headache, nausea, or vomiting, and no other of the characteristic clinical features of nephritis was present, such as anasarca, effusion into serous cavities, anæmia or uræmic symptoms.

When seen at the Infirmary the urine contained a moderate quantity of albumen, but no tube-casts, and comparatively little deposit was thrown down on standing. There was a history of the passage of small oxalate of lime calculi, and of occasional hæmaturia. While under observation he had several attacks of distinct renal colic, which led me to the conclusion that he was suffering from renal calculus, and he was advised to have an operation performed in the hospital. This he refused, but consented after some delay to have it done in private. On exposing the right kidney by a free incision in the loin, the organ was seen to be enlarged, of a dark chocolate colour, and very tense. On examining the kidney with needles for the detection of a stone, free bleeding occurred, and as no calculus could be discovered with the needles I made a free incision into the pelvis in order to explore with the finger. The bleeding was very free and the

wound in the cortex had to be plugged with iodoform gauze. No calculus was found. I felt that I had made either an error in diagnosis, or that my search had been imperfect, and left the case with the belief that harm rather than good had been done by the operation; but to the satisfaction of the patient and myself he ceased to suffer any pain, the albuminuria disappeared entirely, and afterwards the patient enjoyed excellent health.

In this case, from the onset of the trouble till the time of the operation, albumen was constantly present and the quantity of urine remained considerably below the normal, but after incision the albumen disappeared and remained absent, and the quantity of the urine increased. I have no doubt that in this case the relief of tension by the incision facilitated the renal circulation.

Wet or dry cupping over the kidneys may act in a somewhat similar way.

CASE VI.—*Sudden Suppression of Urine—Pain at first Diffuse, afterwards limited to Renal Region—Albuminuria, Blood-Casts, Wet Cupping, Relief of Urinary Symptoms—Inguinal Hernia—Operation—Cure.*

Three years ago a patient, aged 62, came under observation on account of severe abdominal pain associated with sudden and almost complete suppression of urine, nausea, and vomiting, and the pain at first was not limited to any particular spot, but was complained of all over the abdomen. When seen by me the pain had considerably diminished from what it was at the onset the previous day, and physical examination of the abdomen did not cause much increase in suffering unless when firm pressure was made over the renal regions. The bowels had been moved freely, and there

was neither distension nor collapse of the abdomen; no hernia could be discovered. Only highly albuminous urine had been passed since the onset of the pain. The patient had an old stricture, but the bladder was almost empty.

URINE.

1893.	Quantity.	Sp. Gr.	Reaction.	Remarks.
May 20, 10 A.M.,	20 oz.	1016	Acid.	Slight trace of albumen. No blood. Pain set in at 11·30 A.M., and steadily increased till midnight.
,, 11 P.M.,	3 ,,	1018	,,	Very albuminous. Blood drawn off with catheter.
May 21, 8 A.M.,	1 ,,	?		Highly albuminous. Blood-casts.
,, 10 P.M.,	4 ,,	1025	,,	Do. do.
May 22, 10 A.M.,	3 ,,	1028	,,	Do. do.
,, 7 P.M.,	...	...		14 oz. blood drawn off.
,, 11 P.M.,	6½ ,,	1020	,,	Highly albuminous. Blood-casts.
May 23, 2 A.M.,	7 ,,	1018	,,	Do. do.
,, 6 A.M.,	10 ,,	1018	,,	Less albumen and less tube-casts.
,, 11·30 A.M.,	12 ,,	1016	,,	Albumen and blood much less.
,, 6 P.M.,	12 ,,	1016	,,	Do. do.

Temperature never above 100·3°; pulse average, 88, good strength; respirations, 22. Numerous blood-casts in urine. Skin moist.

From the presence of blood-casts it was evident that the source of the albumen was in the kidneys, and the suspicion was aroused as to the possibility of there being an acute tubular nephritis. Acute febrile diseases and their sequelæ were excluded, and there was no reason to suspect cardiac, pulmonary, or cerebral causes of albuminuria.

I applied wet cupping to the loin over both kidneys, and removed in all 14 oz. of blood at 7 o'clock in the evening; by 11 o'clock P.M. the patient passed 6½ oz. of albuminous urine; and during the following night 17 oz. of less albu-

minous urine were excreted, and the pain in the loins subsided. The patient remained moderately well for a day, the 23rd, when the pain in the abdomen recurred, but this time more marked at the umbilicus and on the right side just over the middle of Poupart's ligament, where there was some increased resistance and dulness on percussion. This pain rapidly became more severe, and the patient presented the appearance of a case of acute intestinal obstruction. A very careful examination was made of the abdomen, when the only abnormality to be detected was the dulness and increased resistance just referred to at the region of the right internal abdominal ring. I suspected a small strangulated inguinal omental hernia; operated and relieved it.

The patient made a good recovery, and the albuminuria disappeared in three days.

The following is an almost exactly similar case:—

Case VII.—*Suppression of Urine (supposed erroneously to be Stricture), Hæmaturia, Albuminuria, Pain in Bladder and over Kidneys, Tympanites, Dry Cupping, followed by Secretion of Urine—Symptoms of Intestinal Strangulation.*

I reported the case in detail in the columns of the *Glasgow Medical Journal*, March, 1896, p. 218. In a patient suffering from internal strangulation of the jejunum, the lesion of the bowel was greatly obscured by the circumstance that the patient was sent to the Royal Infirmary as one of stricture of urethra associated with suppression of urine. The idea of stricture was at once eliminated, but the kidneys failed to act until dry cupping was resorted to, exactly forty-eight hours after the onset of the symptoms. The following is the report of the case:—

"The patient, J. M'L., aged 71, said to be suffering from stricture of the urethra, was admitted into the Royal

Infirmary on Tuesday, 3rd December. The patient was in his usual health until Monday, 2nd December, and passed urine quite naturally about 11 o'clock forenoon. Half an hour later a sudden pain seized him across the abdomen, but was most severe below the level of the umbilicus; two hours later the pain became acute, and continued so till admission.

"Previous to coming to the hospital he consulted two medical men, and they passed a catheter; but, failing to draw off any urine, came to the conclusion that the instrument had not reached the bladder, and that the patient was suffering from a stricture. On admission, the house surgeon attempted to introduce an instrument; but, failing to do so, Dr. Newman was asked to see the patient. On examination he found him very weak; the pulse could scarcely be felt; respiration was slow, and the temperature slightly subnormal. The patient complained of considerable pain in the region of the bladder, and the abdomen was slighty distended and tympanitic above the level of the umbilicus; below that level there was a less tympanitic note when first examined. But shortly thereafter the note varied in tone, and became quite as clear there as in other parts of the abdomen. No distension of the bladder could be detected, and on passing a catheter no urine escaped, although the instrument was clearly within the cavity of the viscus. Dr. Newman came to the conclusion that the patient was either suffering from suppression of the urine or rupture of the bladder, although admittedly there were no evidences pointing to extravasation beyond pain and tympanites. The patient said that his bowels were perfectly regular until Sunday night, but since then he had had no movement. The tongue was covered with white fur, and the patient complained very much of thirst. A large enema was given, but returned without fæces. This

was repeated the following morning without any effect. On Wednesday the patient vomited slightly, the matter vomited suggesting, by its appearance, that it was feculent, although free from any distinctive odour. The patient's general condition was improved; but still no urine had been secreted. Dry cupping was ordered to be applied over both kidneys, and this was done in the forenoon. In the afternoon about 8 oz. of urine was passed. He was cupped again in the evening, and during the night and the following morning a considerable quantity of urine was secreted. The urine contained blood and a quantity of albumen larger in proportion than the blood accounted for, also some pus, but no tube-casts.

"On the 5th December patient still complained of abdominal pain, but less severe than the day previous. The physical signs remained practically the same, but, if anything, the tympanites was less marked; pulse considerably improved since admission; temperature slightly subnormal, and bowels still unmoved. In the morning distinct fæcal vomiting set in, and Dr. Newman saw the patient again at 5 o'clock P.M. in consultation with Dr. G. S. Middleton. After carefully reviewing all the facts, the conclusion come to was that the case was really one of intestinal obstruction, complicated by suppression of the urine. Considering the age of the patient, it was deemed advisable to administer another large enema, with the patient in the knee-elbow position; but should this fail in producing any effect, an exploratory incision should be made. There was no evidence as to the position of the obstruction, and no hernia could be discovered.

"At 10 P.M. Dr. Newman, assisted by Dr. J. A. Adams and Dr. D. M'Kellar Dewar, performed abdominal section. On opening the peritoneum, the cavity was found to contain a considerable quantity of blood-stained fluid, and the lower

portion of the bowel, which presented in the wound, was in a state of advanced inflammation; the serous surface was of a dark crimson colour, and at the junction of the jejunum and ileum a constricting band was discovered, including a portion of almost gangrenous bowel. Two inches of the bowel were removed, along with a wedge-shaped portion of mesentery, and the divided segments were united by means of Murphy's buttons. The bowel above the constriction was found to be considerably distended, and the walls were greatly thickened from hypertrophy of the muscular coat. Below the constriction the bowel was almost empty, and the walls softened and atrophied, so much so that suture of the bowel was impossible. The mucous membrane of the bowel above the point of obstruction was distinctly gangrenous, but this change did not affect the other coats."

In these two cases (VI and VII) I have no doubt that in one the omental and in the other the intestinal strangulation produced reflex spasm of the renal vessels or of the walls of the ureter which led afterwards to very marked hyperæmia of the kidneys. The existence of a very marked hyperæmia of the kidneys in cases of acute intestinal obstruction is not simply a coincidence. I would be almost disposed to regard it as a frequent occurrence, and one that should be carefully looked for in all acute abdominal affections; and when indicated by prolonged suppression of urine, the question of the relief of tension should be carefully considered.

The question arises, What is the cause of the anuria in these cases (VI and VII)? Two explanations may be offered—the non-elimination of urine may be brought about either by a spastic stenosis of the ureter, or by spasm of the smaller renal arteries secondary to the lesions of the bowel or omentum.

Examples of reflex inhibition of the functions of the kidney

are numerous. For instance, I have seen complete suppression of urine following the passage of a catheter and succeeded by hæmaturia for some days. Then, again, we have cases of unilateral obstruction such as is produced by the presence of a calculus in one ureter cause complete anuria, which may last for a considerable time; again, in cases of transitory hydronephrosis from angular insertion of the ureter, or from movable kidney, when the obstruction on one side reaches a certain point, the kidney on the opposite side fails to act, even although the hydronephrosis continues to increase in size. These cases seem to be analogous to those described above, but in them all it is very difficult to assert whether the reflex inhibition of the function of the kidney is due to reflex spasm of the walls of the ureters or to contraction of the small renal arteries; but the circumstance that the anuria is in many instances followed by the excretion of albuminous and bloody urine indicates that in these cases, at least, there has been a serious disturbance of the renal circulation. In some instances, doubtless, the anuria may be the result of a general fall in the blood pressure as a consequence of shock, but the circumstance that the pulse was of good strength in Case VI, and the anuria was relieved by wet cupping, is against this argument. Probably the suppression of urine in Cases VI and VII is similar to decrease of secretion in cases of lead colic or that which precedes a paroxysm of eclampsia. In these conditions, however, the spasm of the renal arterioles is probably not so marked, as the attacks are not usually followed by hæmaturia or albuminuria. To cause complete suppression of urine the spasm of the arterioles must be very great, and must involve the majority of the smaller vessels. The extent and gravity of the disturbance of the circulation is clearly indicated by the abnormal constituents in the urine when the attack has passed.

Chapter II.

THE RELATIONSHIP OF MOVABLE KIDNEY TO RENAL COLIC ASSOCIATED WITH TRANSITORY HYDRONEPHROSIS AND INTERMITTENT ALBUMINURIA. TREATMENT BY OPERATION.

Transitory hydronephrosis is met with in cases where the ureter is occluded only occasionally. A clear distinction must be drawn between those cases where, as a rule, the pelvis is not distended, and those where a more persistent swelling becomes temporarily relieved by a sudden urinary discharge. With this limitation, it may be said that transitory or relapsing hydronephrosis is seldom observed. This may be due to the circumstance that in those cases the sac of the hydronephrosis is not often of sufficient size to be detected by the hand, and the symptoms, although acute, are of short duration, being soon relieved by evacuation. Sudden accumulation and rapid subsidence of the swelling is an important characteristic of transitory hydronephrosis, and while, on the affected side, the pelvis is still filling and becoming more and more tense, on the healthy side there may be complete inhibition of the function of the kidney. An explanation of this will be sought presently.

In movable kidney obstruction to the escape of urine through the ureter may happen in three ways—(1) The displacement of the kidney may consist of a rotation of the

organ on its short axis, so that the ureter is twisted round the vessels; (2) there may be a sudden bending of the ureter at any part of its course; or (3) angular insertion of the ureter into the bladder may obstruct the passage of urine.

Whereas most modern pathologists regard the angular insertion and the valvular closure of the ureter to be the cause of hydronephrosis in such cases, Simon, and a few Continental writers, on the other hand, hold the opinion that the collection of fluid within the renal pelvis is the cause of the alteration in the relationship of the kidney and its duct. The latter assume that, a temporary impediment having caused a hydronephrosis, the kidney becomes displaced, and at the same time the lower half of the distended renal pelvis compresses the first part of the ureter; or if the pelvis be dilated more on one side of the point of origin of the duct than the other, the ureter is contorted, and a valvular obstruction created, which becomes permanent. As the accumulation increases the kidney becomes pushed outwards and backwards, while the upper portion of the ureter comes to be situated anteriorly. Another explanation has been offered by Landau, who holds that the frequently repeated displacements, twistings, and kinkings of the ureter in movable kidney are calculated to produce urinary obstruction and hydronephrosis. He maintains that "this view is confirmed by the fact that the majority of hydronephroses of obscure origin are seen in women of considerable age, and on the right side."

Transitory hydronephrosis may be characterised by severe renal colic associated with intermittent albuminuria, or with the presence of tube-casts in the urine, as will be shown in the following cases:—

CASE VIII.—*Movable Kidney—Transitory Hydronephrosis—Suppression—No Tube-casts, but Intermittent Albuminuria—Cure by Operation.*

M. H., æt. 35, a housemaid, enjoyed good health until January, 1889, when she commenced to complain of vague pains, as she thought, in the region of the stomach, but these were not so severe as to interfere with her regular

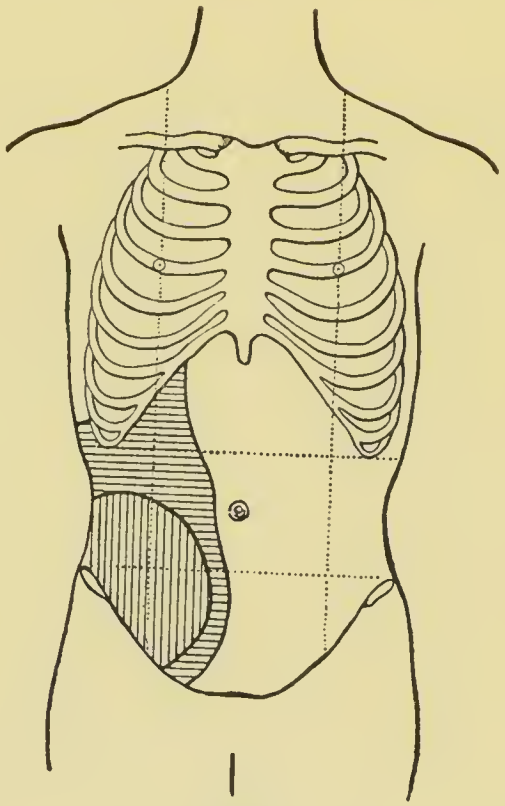

FIG. 1.

CASE VIII.—M. H., æt. 35.

The space occupied by perpendicular lining indicates the position of the hydronephrosis when fully distended; that occupied by the horizontal lining shows the space within which the kidney could be palpated.

occupation. She, however, gradually became thin and anæmic; steadily the pain increased, and after a time it became complicated by dyspeptic symptoms, such as nausea, severe attacks of vomiting, diarrhœa, and occasional constipation.

When I saw her first in November, 1891, she had developed all the characteristic symptoms of movable kidney on the right side, and on palpation the right kidney could be easily

made out. The radius of movement of the kidney is indicated in the diagram (Fig. 1), also the space occupied by the hydronephrosis. The most interesting feature of the case, however, was the occurrence of a transitory hydronephrosis. At first occasionally, but afterwards more frequently, she had more or less sudden attacks of severe pain associated with sudden diminution in the urinary excretion, sometimes amounting to total suppression. This apparent suppression was coincident with a rapid increase in size of the movable tumour within the abdomen, and also with severe paroxysms of pain, which lasted until the swelling was suddenly relieved by the escape of a large quantity of watery and slightly albuminous urine. At all times she suffered from more or less dull aching pain in the loins, extending at times over the whole abdomen, and sometimes down as far as the right knee. This pain differed entirely from what was experienced during an attack. The paroxysmal pain did not last more than six or eight hours, and while it lasted the patient was unable to lie in bed, but nearly always occupied a sitting posture, at first almost erect, but when the hydronephrosis attained a large size she would bend the chest forwards over the abdomen and elevate the knee so as to relieve pressure.

The symptoms just mentioned were accompanied by sickness, nausea, and vomiting. The following is a note of the examination of the urine before, during, and after one of these attacks:—

1889.	Quantity.	Sp. Gr.	Remarks.
May 7, 8 A.M.	5 oz.	1016	Acid; no albumen.
,, 12 noon.	16 ,,	1014	Do. do.
,, 4 P.M.	6 ,,	1026	Severe pain; trace of albumen till 8 P.M. on the 8th May.
May 8, 8 P.M.	36 ,,	1008	Pain gone; trace of albumen.
, 9 P.M.	4 ,,	1012	No pain; no albumen.
,, 11 P.M.	6 ,,	1014	Do. do.
May 9, 1 A.M.	5 ,,	1012	Do. do.

At 4 P.M. on the 7th May, 6 oz. of urine of high specific gravity was passed, and almost immediately following the paroxysm of pain set in, and continued with increasing severity for twenty-eight hours, when it was suddenly relieved after the passage of 36 oz. of urine of low specific gravity.

CASE IX.—*Right Movable Kidney, with Transitory Hydronephrosis from Kinking of the Ureter, Cured by the Operation of Nephrorrhaphy.*

C. G., æt. 34, single, was admitted into the Glasgow Royal Infirmary on the 1st November, 1895, complaining of a dull aching pain in the right loin, which commenced five years ago, and from then till now has steadily increased both in frequency and in severity. This pain was described as being almost constantly present; but over and above it she suffers frequently from paroxysmal attacks of severe colicky pain, which sometimes assumes a very acute character.

During the acute attacks the patient was herself able to feel a distinct swelling in the lumbar region, which on pressure was very tender. These acute paroxysms of pain occurred only at intervals of several months at the onset of the disease, but as time passed they have become more frequent. At the present time they recur nearly every second day. The onset of the pain was gradual, but the relief was sudden. Her own description of the attack was as follows:—

"Suppose the pain begins to increase about 1 o'clock in the day, it steadily becomes more severe until about night (6 or 7 o'clock); at the same time the swelling in the loin gradually enlarges, and sometimes extends beyond the middle line in front; as the swelling increases so also does the pain." During the period of enlargement the urine was scanty and highly coloured, and of high specific gravity. Suddenly a copious

flow of pale-coloured urine took place, the swelling subsided, and the pain was suddenly relieved.

While the hydronephrosis was increasing the patient was generally compelled to go to bed; but very soon she was unable to lie in the recumbent posture, and required to sit up with the thighs flexed on the abdomen, and the chest thrown well forward in order to relieve pressure.

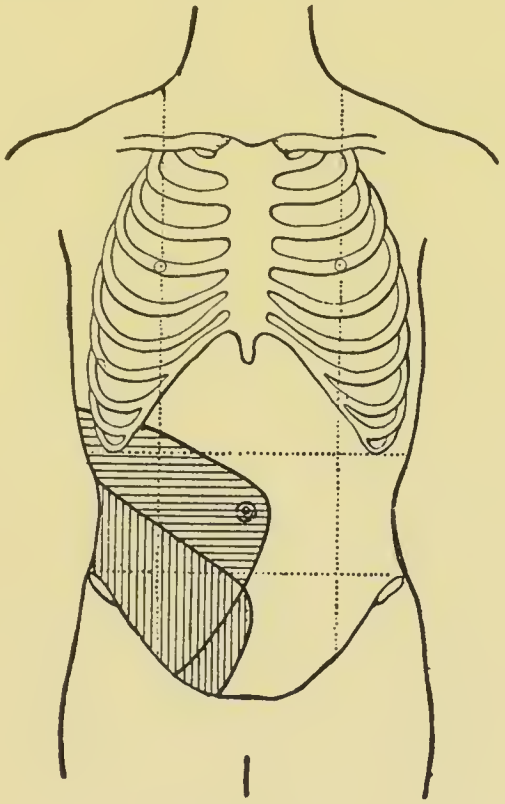

Fig. 2.

Case IX.—C. G., æt. 34.

The radius of movement of the right kidney is shown in the diagram by the horizontal lining, and the space occupied by the transitory hydronephrosis by the perpendicular lining.

On examination of the abdomen between the attacks, the walls were observed to be very flaccid. When the patient lay upon her back a distinct bulging was observed in the lumbar region on the right side, which on palpation was found to be quite soft, but on firm pressure pain was elicited over a considerable area, extending from the crest of the ilium to the ribs, and as far forward as the middle line. The amount

of swelling varied greatly from time to time. When she was suffering from an attack of pain the swelling always increased, and the pain was relieved by a copious flow of pale urine.

Since admission to the hospital the worst attack occurred on the 12th November. The paroxysms of pain began at 5 A.M., and continued until 10 P.M. Towards the end of that period the patient suffered agony of pain, so that morphine required to be administered. Relief came about 10 P.M., accompanied by a copious flow of urine measuring 1,000 c.c., the first quantity passed since 6 A.M.

During the paroxysm of pain the swelling could be felt about 2 inches to the left of the middle line, between the umbilicus and pelvis, and extending downwards in the right iliac fossa to within 1½ inch from Poupart's ligament. During the intervals between the attacks of the pain the right kidney could be found to be distinctly movable, with the excursion ranging from the position of the gall-bladder above to within 4 inches of the symphysis pubis below; at the level of the umbilicus the kidney could be pushed 1½ inch across the middle line. Beyond the condition of the kidney the patient was absolutely healthy. The following note of the characters of the urine before, during, and after an attack is of interest:—

Date.	Quantity in oz.	Sp. gr.			
1895.					
Nov. 13, 3 P.M.	13	1016	Acid.	No albumen.	
,, ,, 9 P.M.	11	1014	Do.	Do.	Pain set in.
,, 14, 11 P.M.	40	1007	Do.	Do.	Pain relieved.
,, 15, 6 A.M.	6	1010	Do.	Do.	Do.
,, ,, 2 P.M.	13	1016	Do.	Do.	Do.
,, ,, 9 P.M.	7	1016	Do.	Do.	Do.

At midnight on the 13th November pain was very severe, and continued so till 11 P.M. the following day, when 40 oz. of urine of low specific gravity were passed.

This case was clearly one of transitory or intermittent hydronephrosis, due to torsion of the ureter when the right kidney became displaced. The course of events noticed was sudden suppression of urine, almost immediately followed by paroxysms of severe pain, which continued and increased in severity until suddenly relieved by the copious flow of dilute urine.

Nephrorrhaphy was performed on the 26th November, 1895, and since that date there has been no recurrence of the pain, nor has any accumulation of urine been observed in the pelvis of the kidney. The main point in the operation was to fix the kidney as high up as possible, and firmly, so as to stretch out the tortuous and elongated ureter.

In this case the operation was completely successful, and the patient is now (December, 1896) quite well.

Case X.—*Right Movable Kidney causing Torsion of the Ureter and Renal Vein, and leading to Hydronephrosis, Albuminuria, and the presence of Tube-casts—Operation—Cure.*

The patient, Miss A., came under my observation at the beginning of 1895. The history of the case, the physical signs, and the symptoms all pointed to right movable kidney of some years' duration. The patient was anæmic and emaciated, and it was considered desirable before an operation was performed to try the effect of complete rest in bed. This treatment by rest and by careful dieting was adopted during January, February, and March, but with comparatively little success, and it was resolved to perform nephrorrhaphy early in May. Frequent examinations of the urine were made during the first three months of the year, and on all occasions it appeared to be strictly normal. The day previous to the one on which the operation was arranged for a careful

examination was made of the kidney, when it was found to be swollen and unusually tender; and when the urine was examined it was discovered for the first time to contain a considerable amount of albumen, and some hyaline and finely granular tube-casts; but these were not found in the deposit, but only when separated by a centrifugal machine. On account of the albuminuria and the presence of tube-casts in the urine the operation was postponed, and on the 3rd of May

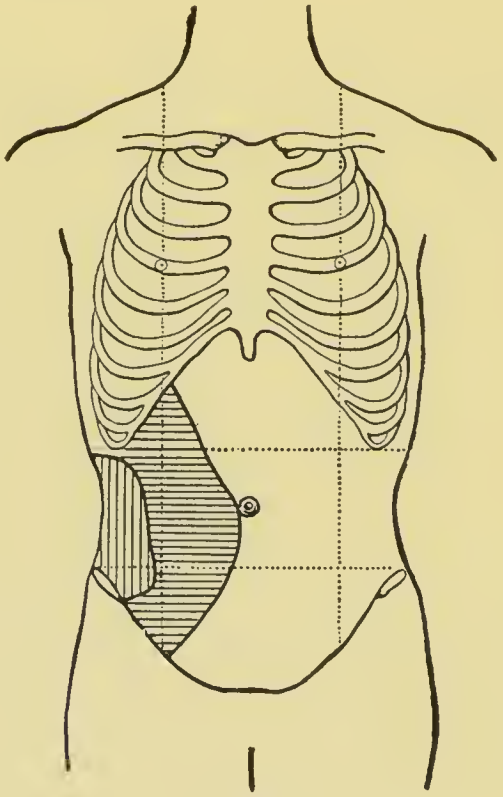

Fig. 3.

Case X.—M. A.

Lining same as Case VIII.

all the samples of urine were carefully examined as shown in the following table. At first the possibility of a nephritis being present was considered, but as no symptoms beyond the albuminuria and the presence of the tube-casts could be discovered, I carefully watched the course of the urine to see if any other explanation of the albuminuria could be

discovered. Every sample passed was kept for the examination, with the following results:—

1895.	Quantity.	Sp. gr.	Remarks.
Apr. 29, 9 A.M.,	9 oz.	1023	Acid; considerable albumen and tube-casts; pain in kidney severe.
Apr. 30, 8 A.M.,	7 ,,	1023	Do. do.
,, 12 Noon,	10 ,,	1019	Acid; trace of albumen; pain much less; tube-casts.
,, 4 P.M.,	13 ,,	1010	Do. do.
,, 9 P.M.,	6 ,,	1015	Acid; no albumen; no tube-casts.
May 1, 2 A.M.,	17 ,,	1009	Do. do.
,, 7 A.M.,	13 ,,	1009	Do. do.
,, 1 P.M.,	10 ,,	1013	Do. do.
,, 9 P.M.,	7 ,,	1014	Do. do.
May 2, 6 A.M.,	10 ,,	1010	Do. do.

With the onset of the attack of paroxysmal pain, sometimes there was present hydronephrosis, sometimes it was absent or not observable; but high specific gravity of the urine, albuminuria, and tube-casts always appeared in the urine at such times, and disappeared at the same time as the pain. Since the operation was performed no albumen or tube-casts have been found.

Case XI.—*Left Movable Kidney causing Torsion of the Renal Blood-vessels—Albuminuria, Tube-casts, Severe Pain, and Suppression of Urine—No Hydronephrosis—Operation—Cure.*

J. D., æt. 41, married, and has a family of nine children. She was at one time very stout, but during the last three years had been steadily emaciating. She first complained of pain in the left kidney in 1887, and when I saw her first in 1894 she was greatly reduced in weight. The abdominal walls were flaccid, and she complained of almost continual pain located in the left lumbar region. At irregular intervals most severe paroxysms of pain set in, and these lasted from three to seven hours, and were accompanied by sickness,

nausea, and vomiting. During an attack the patient always lay upon her left side. In one or two instances, after the paroxysms had passed off, the patient suffered from undue excitability, severe and persistent headaches, and dimness of vision, pointing probably to some uræmic poisoning. On examination of the abdomen the left kidney could be

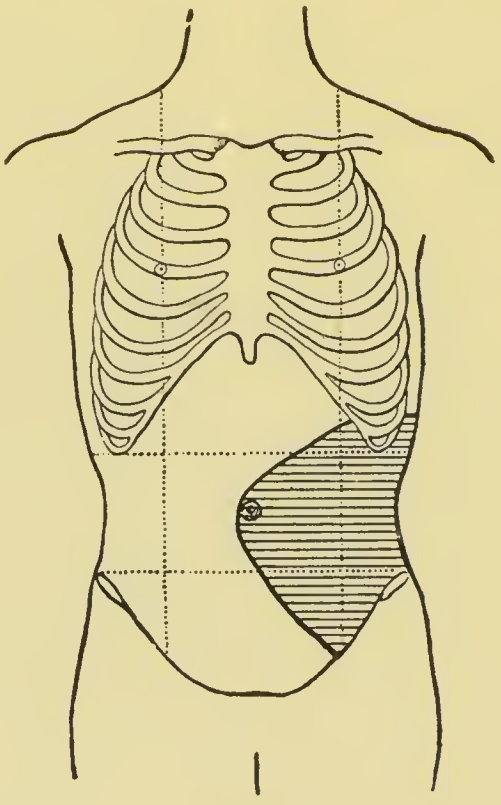

Fig. 4.

Case XI.—J. D., æt. 41.

Lining indicates the space in which the kidney moved.

distinctly felt freely movable within the abdomen, and could be pushed upwards under the left costal cartilages, across the middle line in front, and down into the pelvis. Handling of the kidney produced considerable pain accompanied by sickness. This pain differed in character from that usually felt during a paroxysm. The following is a note of the urine passed during one of the paroxysmal attacks:—

1894.	Quantity.	Sp. gr.	Remarks.
Feb. 11, 2 P.M.,	15 oz.	1013	No albumen ; no tube-casts.
,, 11 P.M.,	17 ,,	1012	Do. do.
Feb. 12, 9 A.M.,	18 ,,	1018	Do. do.
,, 8 P.M.,	10 ,,	1020	Moderate quantity of albumen and a few tube-casts ; pain set in at 6 P.M. on the 12th, and continued till midday on the 15th.
Feb. 14, 7 A.M.,	13 ,,	1023	Do. do.
Feb. 15, 2 A.M.,	11 ,,	1022	Do. do.
,, 9 A.M.,	16 ,,	1012	Trace of albumen.
,, 8 P.M.,	15 ,,	1010	No albumen.

The patient was kept under observation for many months, and although advised to have an operation performed, refused until November, 1895, when, with the assistance of Dr. E. A. Gibson, I performed nephrorrhaphy. The result was quite satisfactory. Patient reported herself well, January, 1897.

In the first two cases there was little or no difficulty in understanding the condition. The increase in size of the movable tumour at the time the symptoms arose, and the disappearance of the hydronephrosis before they were relieved, indicated very clearly that the attacks were due to obstruction to the flow of urine through the ureter. The character of the urine, and the position which the patient assumed in bed, aided us in forming a diagnosis. In cases of hydronephrosis from torsion of the ureter in movable kidney the patient is unable to lie down in bed, but almost always sits up, with the knees flexed on the abdomen and the thorax thrown forwards. In transitory hydronephrosis the quantity of urine is suddenly diminished in amount, as illustrated in Cases VIII and IX, and previous to the paroxysm of pain being relieved a large flow of dilute urine is observed to escape. On the other hand, in cases of torsion of the renal vessels, as in Cases X and XI, the paroxysmal attack is associated

with a sudden and transitory albuminuria, sometimes without suppression of urine, and no increase in the size of the renal swelling. In Case XI, from 8 P.M. on the 12th of February till 2 A.M. on the 15th, only 34 oz. of urine was passed, but of high specific gravity and containing albumen and tube-casts. In all four cases nephrorrhaphy was performed with a good result.

These cases also raise several points of considerable pathological interest.

When the efflux of urine from the kidney is suddenly impeded, we know, from the experiments of Herrmann and those performed by myself, that the quantity of urine excreted in a given time is diminished, and that there is also a reduction in the percentage of solids in the urine. When the backward fluid pressure reaches a certain point the excretion ceases, and this at a point when the pressure on the fluid contained in the ureter is considerably below the arterial pressure. But as soon as the obstruction is relieved, the kidney regains its function, and an abundant secretion of urine of low specific gravity rapidly follows. Fortunately when the escape of urine is impeded by occlusion of the ureter, the velocity of the blood stream is reduced, owing to the pressure exerted by the over-distended uriniferous tubules upon the capillaries and blood-vessels. The urine in the kidney is probably also reabsorbed to some extent, just as in obstruction of the gall-ducts the bile is taken up by the circulation. This is demonstrated by the œdematous condition of the kidney after ligature of the ureters, an œdema which rapidly disappears on the ligature being relieved. The rapid excretion of a large quantity of watery urine after relief of the ligature of the ureter is probably accounted for by the evacuation of the œdematous fluid, and by an active arterial hyperæmia which follows the relief of pressure on the capillaries.

In cases of transitory hydronephrosis, while the pelvis of one kidney is becoming distended the action of the opposite organ is suddenly inhibited as shown by complete suppression. This circumstance has already been referred to under torsion of the renal vessels (p. 25). Many cases have been recorded where a unilateral obstruction has produced a complete anuria, lasting sometimes for days. But it is difficult to say whether suppression on the unobstructed side is due to a spasm of the muscular fibres of the ureter, or to a local reduction of blood pressure from spasm of the arterioles. The circumstance that pain is not a prominent symptom, except on the hydronephrosed side, would point to the latter rather than the former as the cause of anuria.

Take, for example, Case VIII. At 4 P.M. on the 7th of May the patient had a sudden attack of renal colic, which continued with increasing severity for twenty-eight hours. During that time, while the pelvis of the right kidney was being distended with urine, the left kidney failed to secrete, as on passing a catheter into the bladder no urine escaped.

This is a remarkable fact, as one should have expected a compensatory functional activity of the healthy organ rather than a complete suppression of function. The same conditions were observed in Case IX.

Chapter III.

CASES OF CYSTIC DISEASE OF THE KIDNEY, WITH SPECIAL REFERENCE TO THEIR PATHOLOGY, DIAGNOSIS, AND SURGICAL TREATMENT.

In the larger text-books of surgery cystic formations in the kidney are hardly mentioned, and even in special works on the surgery of the abdominal organs very scant attention is given to the subject. In some of the books devoted to renal surgery, however, short notices are to be found, but these are for the most part brief and unsatisfactory. This neglect on the part of many surgical writers is probably due to the circumstance that the diseases under consideration are frequently overlooked during life, and, until within the last few years, even when they were discovered, the surgeon's aid was not often asked. But now that more attention is being given to the surgical aspects of diseases of the kidney, it is well that these maladies should be taken into account in forming a diagnosis.

Cystic degeneration of the kidney is not only of pathological, but also of clinical importance; it has been confounded with ovarian cyst, and has been removed as such by several well-known surgeons who have had the courage to publish their failures, amongst whom I may mention Peaslee, Esmarch, Campbell, Ollier, Archer, Leopold, Schedé, Keeling, and Goodell; and Wagner has published a case of Thiersch's, in which this disease was mistaken for hydatid of the liver.

In cases of nephrectomy for cystic disease of the kidney which I collected some years ago, in fifteen out of twenty-two cases a mistaken diagnosis was made previous to the operation. This illustrates clearly, I think, the necessity for more attention being directed to the subject.

Amongst writers on cystic diseases of the kidney there is considerable diversity of opinion, not only as to the lesions which ought to be included under cystic diseases, but also as to the position in which these morbid conditions should be placed in their general classification. Clearly, accumulations of fluid in the pelvis of the kidney should not be included under cystic formations, but the term should be carefully limited to collections of non-inflammatory fluid in the substance or on the surface of the kidney.

As to the position of cystic formations in a general classification of diseases of the kidney, it is well to keep them in a category by themselves, and not to include them amongst the tumours properly so called. Most authors, however, include cystic disease amongst tumours, the principal reason for this being the increase in the size of the kidney associated therewith; but when we consider the more minute changes, it will be seen that in retention-cysts the kidney dilates and becomes occupied by numerous excavations bounded by a fibrous tissue envelope, and that the process is due to a retrogressive or destructive, rather than a formative or constructive disturbance of nutrition, such as is seen in neoplasms properly so called.

Cysts of the kidney may be conveniently divided into four classes—

(*a*) Simple cysts and cystic degeneration;

(*b*) Those which may be included under the term congenital cysts;

(*c*) Paranephric cysts; and

(*d*) Those due to the presence of parasites.

(*a*) Simple Cysts and Cystic Degeneration.

1. *Simple cysts* are very commonly found in kidneys otherwise normal, and their presence does not often interfere with the function of the organs. These simple cysts, which are generally few in number, are of no great clinical importance so long as they remain small in size, as they cause practically no enlargement of the organ; but, when they come to occupy a considerable space they may cause pressure upon the surrounding parts, and lead to more or less disturbance of function and discomfort to the patient. If some of the tubuli uriniferi are closed by deposits or by tube-casts, or occluded by the contraction of connective tissue, changes result—the secretion accumulates behind the obstruction and distends the capsules of the Malpighian bodies or the lumen of the tubules into cysts filled by altered secretion. Their walls are thin, composed of connective tissue, lined with a proper tessellated epithelium, and the cysts may project beyond the surface of the organ. The contents are generally clear, colourless, or of a pale straw colour, and contain more or less albumen; sometimes, however, the fluid is colloid in character. But while solitary cysts are usually filled with such material, in a few instances they have been found to be occupied by a blood-stained fluid or gelatinous matter, and in the contents of some cholesterine has been discovered. These cysts are possibly congenital in origin, and are likely due to the same causes which produce general cystic degeneration.

In the Museum of the Glasgow Royal Infirmary there is a specimen of a very large single thin-walled cyst,[1] which projects from the middle of the convex border of the kidney; the cortical substance entirely, and in great part also the

[1] Series VII, No. 71, *Catalogue of the Pathological Museum*, third edition.

pyramidal, has become destroyed, so that the cyst almost extends to the pelvis, yet does not open into it. The two cavities are still separated from one another by a thin wall of renal tissue. On microscopic examination the rest of the kidney proved to be healthy, except where more or less altered by the direct pressure of the cyst.

CASE XII.—*Single Cyst of the Left Kidney in a Patient who suffered from Chronic Cystitis, and died suddenly from Cardiac Syncope—Presence of Cyst not suspected during life.*

J. G., aged 61, consulted me in 1884 on account of a chronic cystitis from which he had been suffering for many years. His medical attendant told me that the patient for a long time complained of cardiac weakness, and that physical examination of the chest revealed the presence of marked ventricular dilatation and disease of the aortic valves. When I saw the patient for the first time he was extremely weak, and suffered severely from frequent and painful micturition; he also complained of pain in the loins, but on examination I failed to discover any abnormality in the renal regions. All the urinary symptoms pointed to chronic cystitis, with hypertrophy of the prostate; albumen was present in the urine, but not more than could be accounted for by the pus; no tube-casts were discovered, nor were any other abnormal constituents found at any time. The patient died within a fortnight of my first seeing him, and at the *post-mortem* examination the condition of the left kidney was discovered.

The cyst[1] contained 6 oz. of colourless fluid; its wall was very thin and translucent, and to the naked eye appeared as if formed of the capsule only; but, on more careful examination, the capsule was found to be separable from the proper

[1] Series VII, No. 75, *Catalogue of the Pathological Museum*, third edition.

cyst wall. The pressure of the cyst-contents caused a deep depression on the convex aspect of the kidney, but otherwise the kidney was normal.

CASE XIII.—*Large Simple Peripheral Cyst of the Left Kidney, which caused Pressure Symptoms, but no Urinary Disturbance —Operation—Cure.*

G. W., aged 49, an ironworker, was sent to me by Dr. James Laurence, of Cumnock. He complained of pain in the left lumbar region, which was occasionally severe when he over-exerted himself; but generally it was dull, and sometimes only amounted to a sense of weight in the affected side. The pain was always limited to the renal region; but, from the constant discomfort he was subjected to, the patient was anxious for relief.

He was first examined by me at the Western Infirmary in May, 1888, when I found the abdominal walls rather flaccid, except in the left lumbar region, where there was a distinct swelling, fluctuant and dull on percussion, and on the anterior aspect of the swelling there was a circumscribed hard mass, which was movable. There were no urinary symptoms at any time, and the only complaints the patient made beyond the local pain were sickness after taking food, weakness, and inability to do his work. The physical signs were those of hydronephrosis, except that the swelling never varied in size, and the urine was regular in quantity and normal in character. The swelling was about the size of a large cocoa-nut. I made a lumbar incision, and found the posterior aspect of the kidney occupied by a large single cyst, which pushed the organ forward. The wall of the cyst was thin and projected considerably beyond the surface of the kidney, and from the pressure of the cyst-contents the posterior aspect of the kidney was deeply concave, so that the deepest part extended to the

pelvis, but did not open into it. The fluid (25½ oz.) was clear, of a pale straw colour, and contained a trace of albumen and of urea, and a few crystals of cholesterine.

After opening the cyst the kidney was fixed to the parietes, and the patient made a good recovery, and was soon able to follow his usual occupation.

These simple cysts are occasionally found in kidneys otherwise normal, and may be regarded as pathological curiosities, as they seldom attain the size described above, nor do they often give rise to symptoms so severe as to demand operation. They rarely interfere with the function of the kidney, and, unless of considerable size, are not discovered during life, and hence rarely call for the intervention of the surgeon. I did not explore with a trocar, as it is a mode of treatment not free from danger in hydronephrosis; and further, before the operation I was not certain that the cyst was a simple one.

2. *General Cystic Degeneration of the Kidney.*—In place of being occupied by a few small cysts, or by one large cyst as in the cases just described, the whole kidney may be converted into a huge conglomeration of cysts of varying sizes and colour, and so closely packed together that with the naked eye it is impossible to detect a trace of renal tissue; but even although the organ is increased to ten or twenty times its normal bulk, its renal form is maintained by the enlarged mass. The degeneration generally affects both organs, although perhaps not to the same extent, and is not uncommonly associated with the formation of cysts in the liver and thyroid gland. The kidneys may not attain such dimensions as to be easily detected during life, unless carefully looked for; while, on the other hand, a case has been recorded in which the organ so increased in bulk as to weigh 16 lb., and measured 15¼ inches in length.

This very unusual case was published by Dr. Hare in the *Pathological Transactions* for 1850-51. A somewhat smaller specimen is in the Royal Infirmary Museum. It was removed from the body of a man aged 60. During life no renal disease was suspected, but after death both the kidneys were found to be the seat of cystic degeneration. In the specimen (the right kidney when removed from the body weighed 84 oz.), the smaller cysts were filled with firm gelatinous material, while the contents of the larger were fluid and clear.

CASE XIV.—*Severe Renal Pain, Nausea, Vomiting, and rapid Emaciation; also Symptoms of Transitory Hydronephrosis following a Natural Labour—Physical Signs of Movable Cystic Kidney—Operation followed by considerable relief.*

Mrs. M'N., aged 30, was sent by Dr. Beveridge, of Hurlford, and admitted to the Glasgow Royal Infirmary, 24th November, 1896, complaining of pain in the abdomen and in the right loin, with rigors and painful micturition following a natural labour.

She was the mother of five children, and after the birth of the last child she had rigors three days in succession, and within a few days thereafter she began to experience more or less pain on micturition, which was followed by severe sickening pain in the abdomen and in the right loin; this pain was only present when the patient moved about or when the kidney became displaced; while resting in bed the pain was never very severe. It was constant in situation and aggravated by pressure. Since the onset of the pain she had become progressively weaker, and on admission she also complained of loss of appetite, flatulence, and constant nausea on taking food. The patient said that during the last three months she had lost considerably in weight.

The bowels have been as a rule constipated, the tongue

furred, the patient sweats very much at night, and, with the exception of three days, she has been unable to be out of bed since her confinement.

The temperature from the 24th November to the 7th December was between the normal line and 100·2° F.; of fourteen evening temperatures, eight were up to or above 100° F., the morning temperatures were about 99° F. She never noticed any abnormality in the urine, except that the quantity was large and she had to pass water very often, and has had to do so for some years. When the pain in the kidney was severe, occasionally, very soon after the bladder was emptied she found it suddenly distended again, and when this occurred it was always followed by relief of the pain, but a swelling present in the loin did not on any occasion disappear. There was no history of hæmaturia at any time. From the 27th November till the 5th December the quantity of urine varied from 1,320 to 2,624 c.c., and on standing for twelve hours a deposit amounting to from 30 to 50 c.c. was thrown down. The urine was of a pale straw colour, its specific gravity 1008 to 1010, and on one occasion 1020. The urine contained a trace of albumen, and the deposit consisted almost entirely of mucus, urates of soda, with a few leucocytes and epithelium, but, after repeated examinations, no tube-casts or tubercular bacilli were discovered.

Physical Examination of the Abdomen.—The patient was very pale and anæmic, emaciated, and the abdominal wall was lax; the hepatic, splenic, and stomach percussions were normal; in the right loin there was a distinct hard non-fluctuant swelling, rounded but irregular on the surface, and when pressed upon it was easily moved towards the middle line. The swelling extended under the anterior margin of the liver and downwards as far as the crest of the ilium, and while the patient was lying upon her back and the swelling

occupied the loin, the inner margin of the mass was felt with the hand to extend within 4 in. of the middle line in front. The size of the swelling as detected by palpation did not correspond to the dull area; on percussion, the anterior margin of the swelling gave a clear rather than a dull note. Percussion over the swelling in the loin was dull, but on passing forwards a resonant note was obtained even where the enlarged kidney could be clearly made out with the hand; the percussion of the upper limit of the swelling was obscured by the liver, and the lower margin by the ilium. On palpating the kidney it could be easily pushed out of its position in the right loin, but when it was pressed over the middle line, or when it assumed the same position on movement of the patient, severe sickening pain was brought on, and if the organ was not replaced soon nausea set in. There was no enlargement of the left kidney. The bladder on examination was found to be healthy, and there was nothing abnormal in any of the other abdominal organs. The lungs were practically normal; there was evidence, however, of slight hypertrophy of the heart, although no increased arterial tension could be made out.

The facts, then, which we had to deal with were briefly these:—the history of sudden onset of pain in the right lumbar region, with rigors and painful micturition following a natural labour, but without pyuria or much elevation of temperature; pain constant in situation and coincident with a rounded but irregular non-fluctuant renal swelling, which was freely movable; pain aggravated by pressure or by displacement of the right kidney. The patient suffered from night sweats, constipation, flatulence, and almost constant nausea, and was rapidly emaciating. The case was clearly not one of abscess, pyonephrosis, or tubercular disease. The absence of any marked elevation of temperature and of pyuria, together with

the fact of the swelling being non-fluctuant, dismissed the possibility of any of these diseases. Therefore the only conditions which remained to be disposed of were cystic degeneration and tumour of the kidney, or these conditions combined with some hydronephrosis. The physical characters of the swelling—viz., its large size, rounded contour, nodulated surface, and firm consistence—pointed to a kidney having undergone cystic degeneration, and probably the onset of the pain was accounted for by the enlarged kidney becoming movable after delivery; but the circumstance that the bladder was occasionally suddenly filled after evacuation, and that this was followed by relief of pain, pointed to some distension of the pelvis of the kidney, probably a transitory hydronephrosis from some obstruction in the ureter. The diagnosis between renal tumour and cystic degeneration was based upon the character of the pain and the absence of hæmaturia; the only tumours that were likely to attain a size sufficient to explain the enlargement of the kidney were sarcoma or cancer, and in either of these instances before the organ had increased to its present dimensions severe hæmaturia would probably have occurred. Although rarely severe in the early stages of malignant disease, hæmaturia is almost constantly present in the later stages, and is then generally very profuse; and when the hæmorrhage has commenced it is more profuse and less transient than when due to other causes. It is generally spontaneous and continuous, although at intervals liable to aggravation. The pain, also, in tumour is different from what was found in this case. In malignant disease the pain is constantly present and not relieved by or aggravated with movement of the body, and before the tumour has attained the size of the swelling in this case the suffering becomes intense, and is not limited to the lumbar region or hypogastrium of the affected side, but generally extends to

the chest, across the middle line, or to the hip and lower extremities.

I therefore came to the conclusion that we had to deal with a case of cystic degeneration of the kidney, associated with transitory hydronephrosis. On the 7th December, 1896, the kidney was exposed by a lumbar incision, and on opening the adipose capsule the cortex of the kidney was seen to be occupied by numerous cysts of various sizes. The organ was greatly enlarged, so that the pelvis of the kidney could not be explored with the finger through the wound. The adipose capsule was freely separated from the surface of the kidney, and a considerable portion of it removed; the organ was then sutured to the parietes.

The patient made a rapid recovery, and since the operation the swelling has diminished in size, partly accounted for by the removal of the adipose capsule, and probably also by the disappearance of the pelvic distension present previous to the operation. The patient was dismissed on the 12th January, and she reported herself on the 11th March. She then said that since the operation she has suffered very little from pain in the abdomen, but that she occasionally still complains of flatulence and indigestion. There were no indications of retention of urine in the renal pelvis since the operation, and the pain in the lumbar region had subsided.

Case XV.—*Cystic Degeneration of both Kidneys—Persistent Renal Pain, Anæmia, and Emaciation—Hæmaturia from Left Kidney only—Albuminuria, Granular and Hyaline Tube-casts—Physical Signs of Cystic Kidney on both sides—Hypertrophy of the Heart—Death after Five Years from Uræmia.*

W. K., a male, aged 46 years, consulted me in 1881, when he complained of pain in both loins, from which he had been suffering for the previous eighteen months. At the time I

saw him first he complained of loss of appetite, and occasional nausea after taking food, also headaches and giddiness; but what alarmed him most was the persistent renal pain and hæmaturia. The latter symptom had been present for seven months. At first the quantity of blood was small in amount, being only sufficient to tinge the urine, and when the urine was allowed to stand a red deposit was thrown down, which did not amount to more than from a half to one per cent in volume. When the patient had been under observation for some time I made a careful examination of the urine, in order to determine the relative proportion between the amount of hæmoglobin and the quantity of albumen present in the urine, with the following results:—

TABLE SHOWING ANALYSIS OF THE URINE ON VARIOUS OCCASIONS, WITH SPECIAL REFERENCE TO THE AMOUNTS OF HÆMOGLOBIN AND ALBUMEN.[1]

Date.	Quantity of Hæmoglobin.	Quantity of Albumen.	Specific Gravity.	Quantity of Urine in Twenty-four Hours.
	Per cent.	Per cent.		Oz.
1881—June 7, . . .	0·101	0·237	1011	60
,, ,, 8, . . .	0·097	0·318	1010	62
,, ,, 9, . . .	0·072	0·201	1018	31
,, Aug. 20, . . .	0·123	0·310	1018	32
,, ,, 21, . . .	0·124	0·379	1016	76
,, ,, 22, . . .	0·017	0·147	1005	78
,, Dec. 5, . . .	0·071	0·239	1005	78
,, ,, 6, . . .	0·092	0·210	1003	100
,, ,, 8, . . .	0·100	0·307	1010	70
1882—Feb. 11, . . .	0·131	0·370	1018	34
,, ,, 13, . . .	0·127	0·206	1010	50
,, ,, 17, . . .	0·130	0·179	1018	31
Average of 12 examinations, .	0·099	0·358	1010	58

When albuminuria is due simply to the presence of blood, the ratio of albumen to hæmoglobin is as 1 is to 1·6. As shown

[1] For method of examination, see Newman's *Surgical Diseases of the Kidney*, p. 82.

by the foregoing table, in this case the amount of albumen was relatively greater, namely, as 358 is to 99; or, to state it more simply, as 3·6 is to 1—that is to say, the whole of the albumen present in the urine was not accounted for by the presence of blood; indeed, not more than a fifth part of it could be properly attributed to the hæmaturia. Repeated microscopic examinations of the urine failed to show the presence of blood-casts, but on almost all occasions finely granular and hyaline tube-casts were found, together with free blood corpuscles, a few leucocytes, and some epithelial cells.

The urine from both ureters was examined separately at three different times, and it is a fact worthy of note that, while on all occasions that from the left kidney contained blood, the urine from the right kidney was free from it.

DURING 1884.—EXAMINATION OF THE URINE FROM THE TWO URETERS SEPARATELY.[1]

	Right.	Left.
Appearance,	Pale straw-colour, clear; on standing for eight hours slight deposit of epithelium, and a little mucus.	...
Hæmoglobin,	None.	1 in 6,000.
Reaction,	Neutral.	Neutral.
Albumen,	A trace.	Larger in amount than from right kidney.
Tube-casts,	Hyaline and granular.	Hyaline and granular.
Microscopic examination,	Slight deposit of epithelium and mucus, a few tube-casts, no blood or pus.	Deposit the same as from right kidney, with red blood corpuscles added.

Physical Examination.—The patient was emaciated and very anæmic. The hepatic dulness and stomach resonance were normal. The spleen was slightly enlarged.

[1] Silbermann's method of compressing the ureters was employed.

In both loins there was a non-fluctuant swelling, rounded, slightly irregular on the surface, and when a little pressure was employed the patient complained of considerable pain. Percussion over the swellings was dull, except at the anterior margin, where a resonant note was obtained, even where a feeling of undue resistance was evident to the finger. An area of diminished resonance gradually passed into that of the renal dull area, so that it was not possible to fix any clear line limiting the anterior margins of the renal swelling. On the right side the percussion of the upper limits of the enlarged kidney was obscured by the hepatic dulness, although the margin could be easily felt on palpation; the right kidney was slightly movable. On the left side the splenic percussion interfered with that of the kidney.

By palpating deeply, the limits of both kidneys could be more clearly made out than by percussion. The right kidney occupied the whole space between the lower margin of the liver and the crest of the ilium, and extended outwards $4\frac{1}{2}$ inches from the vertebral column when the patient was lying on his face. The left kidney was a little smaller.

During the time the patient was under observation the kidneys slowly but steadily increased in size, and at no time either suddenly increased or diminished, even although the quantity of urine varied greatly in amount.

Examination of the chest revealed emphysema of both lungs and hypostatic hyperæmia of the bases, also some chronic bronchitis, and hypertrophy of the heart without any valvular lesion. The second sound was clear and slightly accentuated; there was no murmur, but the sphygmograph showed increased arterial tension.

On account of the severe pain the patient was anxious to have an operation performed, but seeing that in such a case of cystic degeneration surgical interference could do little

good, I advised him to go to the Royal Infirmary, where he remained for six weeks, and improved a little during his residence there. I saw him on many occasions at considerable intervals, and found that the symptoms varied greatly from time to time. Sometimes he enjoyed comparatively good health, while at others he was extremely feeble, sick, and quite unable to take food. He lingered on until November, 1886, when he died with symptoms of uræmic poisoning.

A *post-mortem* examination, made on the 10th November, 1886, showed the heart to be greatly hypertrophied (23 oz.), without valvular disease; hypostatic hyperæmia, emphysema, and chronic bronchitis in both lungs; nutmeg liver, passive hyperæmia of the spleen; ascites (15 oz. of serum). "The kidneys weighed 28 oz., and are both converted into a large conglomeration of cysts of varying size and colour, and so closely packed together that it is difficult to detect any renal tissue with the naked eye, although with the microscope abundance of tubules and glomeruli can be seen. In both kidneys there is also evidence of chronic tubular and interstitial nephritis. The only difference between the right kidney and the left one is, that whereas the latter is somewhat the larger, the cysts in the former are not so numerous, and are more deeply pigmented."

The specimen is in the Royal Infirmary Museum, Series VII, No. 89.

CASE XVI.—*Dull Pain in Right Loin for Twenty Years—Occasionally Severe Renal Colic—Nausea—Loss of Appetite—Emaciation—Intermitttent Pyuria and Albuminuria—Physical Signs of Cystic Degeneration of the Kidney on Right Side only—Exploratory Operation.*

On the 11th September, 1896, I was asked by Dr. Andrew Richmond, of Paisley, to see a patient who complained of pain

in the right loin, from which she had suffered more or less for twenty years. She had dull aching pain in the lumbar region, which was almost constantly present; but besides this dull pain she had occasionally more severe attacks of suffering, the last of which occurred in August. This pain was very severe and accompanied by loss of appetite, flatulence, irregularity of the bowels, and nausea. She was also troubled with headaches and giddiness. Dr. Richmond attended the patient during several of these acute attacks, and he observed that the urine contained a considerable quantity of albumen when the pain in the side was severe and the swelling more marked, while in the intervals between the attacks it was quite free from abnormality. No blood was observed by Dr. Richmond nor by any of those in attendance, nor were tube-casts found in the urine.

When I examined the patient on the 11th September she was very anæmic and much emaciated, and the skin and conjunctivæ were unduly yellow; the pulse soft and weak; temperature, 98° to 101° F. The thoracic organs were normal; no hypertrophy of the heart. The hepatic dulness was slightly increased, and the stomach resonance extended over a much larger area than normal. The spleen was slightly enlarged.

In the right loin there was a rounded non-fluctuant smooth swelling, pressure on which produced some but not considerable pain. The swelling was found to be slightly movable; percussion over it was dull, and the dull area occupied the space between the ribs and the crest of the ilium, and extended to within $3\frac{1}{2}$ inches of the middle line. The size of the swelling as detected by palpation did not exactly correspond to the dull area on percussion, the anterior margin of the swelling giving a clear rather than a dull note. The limit of dulness was not very sharply defined, the resonance gradually tapering away

from the tympanitic intestinal note to the dull renal area. By palpation the swelling could be very clearly limited on the right side, while, on account of the emaciated condition of the patient and the looseness of the abdominal walls, the left kidney could be felt easily and recognised to be normal in size, and it at no time caused trouble, nor had it been enlarged.

The urine passed on the 11th and 12th September was found to be of a light straw colour. Specific gravity, 1015 to 1018; urea, 1·8 to 2·1 per cent (after the albumen was separated by boiling); reaction acid. Pus and albumen were present, the latter being larger in amount than could be accounted for by the former. No renal tube-casts or other deposit. The pus varied considerably from day to day, and the quantity of albumen also altered, but not in any ratio to the pus present.

The family history obtained from her doctor was:—"Both parents enjoyed good health, but unable to ascertain the cause of death. The patient's eldest daughter suffered from a renal swelling, which was operated upon successfully, and proved to be a cystic kidney with a pyonephrosis. Two members of her family died when young from nephritis (post-scarlatinal), and another member of the family, although apparently in perfect health when examined for life insurance, was found to have a good quantity of albumen in his urine, but ultimately it cleared away, and has not returned.

"Another daughter consulted me regarding a swelling on the left side, which was suspected to be spleen, but in reality is more probably an enlarged kidney." [1]

The facts then were:—The history of an old-standing

[1] Dr. Richmond asked me to examine this patient, whom I found to be the subject of cystic degeneration of the left kidney. The physical signs were characteristic, but beyond the discomfort arising from the increase in the size of the kidney she did not complain of any symptoms.

renal pain with sudden exacerbations resembling renal colic, associated with the appearance of albumen in the urine, and later on with pus, both of which were intermittent, disappearing completely between the attacks. Added to these symptoms we had the presence of a persistent rounded swelling in the right loin, undoubtedly of renal origin. There were none of the more usual symptoms of chronic nephritis as met with in cases of cystic degeneration, viz., hypertrophy of the heart, increased arterial tension, uræmic symptoms, disturbance of vision, diminution in the quantity of urea or other urinary ingredients, nor could tube-casts and renal epithelium be discovered in the urine. Albumen was present during the attacks, and was in excess of what might be due to the pus.

The persistent renal swelling was the most important objective sign of disease. To what condition of the kidney was it due?

Swelling in the renal region may be caused by hydronephrosis, pyonephrosis, cystic degeneration, abscess or tubercular disease of the kidney, and simple or malignant neoplasms.

The fact that the symptoms had extended over a very long period excluded most of those conditions, and practically limited the diagnosis to hydronephrosis, pyonephrosis, or cystic degeneration, and the swelling being non-fluctuant dismissed the idea of any large fluid accumulation. The family history showed that a daughter had been operated upon for a combination of cystic disease with pyonephrosis. Had we then another example of the same condition?

In advanced cystic disease the symptoms are seldom pronounced—indeed, beyond swelling in the loins, they are those of chronic Bright's disease—but in this case the swelling was only in one loin, and the patient suffered from none of the more serious symptoms of chronic nephritis. The anæmia, the great derangement of the digestive organs, the general

weakness, and the occasional albuminuria were probably, however, the precursors of graver symptoms, and were of themselves sufficient to threaten the life of the patient, while the appearance of considerable quantities of pus in the urine seriously complicated the case.

In this case catheterisation of the ureters was considered inadvisable on account of the great general weakness of the patient and the acute nature of the attack.

The question of making an exploratory incision was carefully considered, and it was resolved to wait the course of events. During the third and fourth weeks of September the patient's condition improved somewhat, but during all that time considerable but varying amounts of pus and albumen were present in the urine. At the beginning of October, the patient had a very acute attack, and suffered greatly from the symptoms described above, and in an aggravated form. She was very prostrate when I saw her on the 7th of October, and she had practically retained no food for three or four days. The swelling in the right loin had apparently increased in size, and the feeling of resistance was more distinct than formerly. The temperature was 98·4° to 101·2°; pulse, very weak, 96; respirations, 20.

Considering all the facts of the case, I felt justified in recommending an incision. The swelling in the loin had increased, the quantity of pus in the urine augmented, and the symptoms aggravated, and unless some relief was found it was evident that the patient's life was in imminent danger from exhaustion.

On the 8th October, the right kidney was rapidly cut down on by lumbar incision, exposed, and its substance found to be occupied by large numbers of small and large cysts.

On exploring the pelvis with an aspirator needle only a small quantity of pus was withdrawn, showing that the pus

was formed in the pelvis, but was not retained there. In view of the cystic degeneration of the kidney I did not consider it advisable to explore the kidney further. The wound healed in three days, but the vomiting and sickness continued persistently after the operation, and the patient died from exhaustion on the fifth day.

Pathology.

I have examined a large number of specimens of chronic tubular and interstitial nephritis, and have frequently found them to contain cysts of all sizes—from mere microscopic expansions of the uriniferous tubules to cysts capable of containing several drops of fluid. When the cysts are numerous the disease appears to be uniformly distributed, and the whole kidney is converted into a conglomerate mass; but if the cysts be few in number and small in size they will be found most abundant in the intermediate zone between the medulla and cortex — viz., in the zone of limitation. In many specimens plugs of colloid material are seen, usually at a part of the uriniferous tubule where constriction has occurred; above this the tubule is irregularly distended and contracted, so as to form a chain of minute cysts. The capsule of the cyst is formed by the connective tissue of the kidney, which is generally increased in amount and firmer in consistence than normal, but may be so scanty that one is almost led to believe that the boundaries of the cyst are formed of little more than the basement membrane of the uriniferous tubule. The epithelium lining the cyst is, as a rule, flattened and atrophied, and the contents frequently escape in preparing the section, even when the celloidin method is employed. The paraffin method of imbedding was used with good results even in advanced disease. Associated with the dilatation of the

uriniferous tubules there is generally marked atrophy of the rest of the parenchyma of the organ, and, as far as I have observed, always more or less interstitial nephritis. Whether the tubules become obstructed by epithelial *débris* or tube-casts from within, or by the contraction of the inflammatory connective-tissue products around them, is a question at present difficult to answer. Probably both causes exercise a considerable influence in the production of the diseased condition. Cysts of small size are frequently observed in the cortex, and owe their existence to a constricted condition of the neck of Bowman's capsule, or obstruction of the tubule close to the Malpighian body.

I believe that the disease is the result of a localised cirrhosis of the kidney causing obstruction of the orifice of the Malpighian capsules or of the cortical tubules; in other words, they are retention cysts. In most of the specimens I have examined the smaller cysts are in the medulla, and the larger cysts in the intermediate zone, while in all instances in which cysts have been found there has been at the same time more or less large collections of inflammatory cells separating the tubules from one another. Probably on account of this interstitial hyperplasia, many other theories have been advanced to explain the etiology of the large polycystic kidney; and at the same time the view that cirrhosis is an essential factor in the causation of cystic degeneration has been controverted on the ground that, while cirrhosis of the kidney is common, cystic degeneration is rare, and even in cases of disease of the kidney where the tubuli are blocked by casts or otherwise, cysts may not be found.

The other theories offered to explain the pathology of cystic degeneration are, briefly, that cystic kidney is due to the presence of embryonic rudiments—retained remnants of the Wolffian body—that there is a combination of

mesonephros with metanephros, and that the cysts in the kidney are due to late development of these rudimentary cells; indeed, retention cysts originate in the tubules of the Wolffian body. Kölliker's view is that the renal tissue is formed by tubular extension from the branching upper end of the ureter, and if this view be accepted, one can understand how congenital cysts of the kidney may be due to want of differentiation of the metanephric blastema from that of the mesonephros. It is true that remnants of the Wolffian body are widely distributed, and may be found in the ovary and testicle, and in these situations may give rise to cysts. Remnants, however, of the Wolffian body have not yet been demonstrated in the kidney; if, however, fragments of the Wolffian body were found in the kidney, the discovery would be strongly in support of the embryonic origin of cysts. The congenital theory is supported by the circumstance that cystic degeneration is frequently associated with congenital malformations and other deformities. I have observed cystic kidney coincident with malformations of the aortic valves, of the septum ventriculorum, and cases have been recorded where other deformities have been found. This frequent association was pointed out by Virchow, who regards cystic kidney to be due to atresia of the papillæ and the uriniferous canaliculi.

Another theory has been advanced—viz., that the primary change is due to a morbid condition of the renal epithelium, while a third presupposes that a mucoid or colloid degeneration takes place and gives rise to the cysts.

Symptoms.

In discussing the symptomatology of cystic degeneration of the kidney, Dr. W. H. Dickinson states that "the pathognomonic

feature of the disease is the double tumour, a sign generally unfound and unsought for, the observer being generally satisfied to regard the case as one of granular kidney." I have inquired into the statistics of recorded cases, and find that in less than one half a tumour has only been found in one side; and this concurs with my own experience, as shown in the above cases of cystic kidney. I have found 105 cases recorded, and of these the malady appears to be almost equally distributed on the right or left sides, so that there seems to be no special predisposition on one side over the other. The statistics also show that it would be rash to conclude that, because the disease is not bilateral, therefore it is not cystic degeneration. In many instances, however, while one kidney has been found to be greatly enlarged, the opposite organ has been involved to a less degree, to an extent not appreciable to the hand during life.

The subjects of cystic degeneration of the kidney have been more often males than females, in the proportion of 60 per cent of the former to 40 per cent of the latter. Of the ages given the average is a little over 49 years, and with one exception the disease has been limited to adults. The symptoms of cystic degeneration of the kidney are essentially those of chronic Bright's disease, the cysts being in the majority of cases the consequence of chronic interstitial nephritis. In cystic kidney, however, dropsy is seldom observed; but hæmaturia was noted in nearly 25 per cent of the cases. The urine was usually pale, copious, and of low specific gravity—in some instances as low as 1005—and may contain tube-casts either finely granular or hyaline. In some instances hæmaturia was very pronounced, so that coagula formed in the bladder, and produced retention, or even suppression, when coagulation had taken place in the pelvis or the ureter.

The general aspect of the patient is probably the most

characteristic feature. There is nearly always anæmia, loss of flesh, a sallow appearance of the skin, and marked gastro-intestinal disturbance, as indicated by loss of appetite, sickness, vomiting, constipation, or diarrhœa; the circulation is also frequently impaired in advanced cases, as indicated by cardiac hypertrophy and increased arterial tension. It is extremely difficult to estimate the duration of the disease, as it comes on very insiduously, and does not at first attract the patient's notice or that of his medical attendant, and the symptoms are apt to be attributed to other causes than to renal disease. Cases have, however, been recorded where symptoms have existed for ten, fifteen, or twenty years. The causes of death are not recorded in many of the cases that have been published; but taking those where the immediate cause of death has been stated, coma and convulsions have preceded death in 39 per cent of the cases, while uræmia occurred in 15 per cent, œdema of the lungs in 7 per cent, and cerebral hæmorrhage in 15 per cent. The heart was found to be hypertrophied in 60 per cent of the cases, and the arteries atheromatous in 15 per cent.

The question of diagnosis of cystic degeneration from other forms of enlargement of the kidney has been already alluded to in considering individual cases, especially in Cases XIV and XVI. In the first-mentioned the cystic condition of the kidney was complicated by transitory hydronephrosis and some mobility of the organ; while in Case XVI the cystic disease was associated with intermittent pyuria, caused by a pyelitis.

Leaving out of account such cases as these, and limiting attention to uncomplicated cases, two questions must be carefully considered. Is the swelling due to renal enlargement? and if it is, how are we to distinguish between polycystic kidney and other maladies associated with increased bulk of the kidney?

The general characteristics of a renal swelling, as distinguished from morbid formations in other organs, may be properly considered before we go on to discuss the diagnosis of one form of renal enlargement from another.

The kidney being placed posterior to the peritoneum, when enlargement occurs the serous membrane is dissected from its posterior attachment, and the abdominal contents, being least resistant, are pressed forwards; while the firm structures posterior to the kidney seldom yield so as to cause more than than an indistinct fulness in the loin. Therefore, while the enlarged kidney is in close contact with the posterior abdominal wall, it is separated from the anterior by the abdominal contents. The colon is situated to the front and on the inner side, unless the enlargement is extreme, so as, by dissecting the peritoneum from the anterior abdominal wall, to bring the kidney into contact with it. The small intestine is also in front of the renal swelling, and on percussion the renal dulness is found to be continuous with that of the spine. It may be inferred from what I have just said that these relationships always exist; but, although this is the almost universal rule, there are a few exceptions, which, however, it is not necessary to consider at present.

The swelling is usually rounded in all its margins, and its inner border is lost against the spine. When small it is confined to one side of the abdomen, but if greatly enlarged, although in the first instance its increase is only noticed between the ribs and the crest of the ileum, the growth may cross the middle line, and occupy a considerable part of the opposite side of the abdomen. As may be supposed, the signs of displacement of neighbouring organs will slightly vary according as the disease involves one or other part of the kidney, and also they will depend upon whether or not adhesions have been formed. Sometimes percussion fails to

betray the presence of bowel in front of the swelling on account of the intestinal gas having been expelled by pressure; usually in these circumstances careful palpation succeeds in revealing the empty intestine between the renal swelling and the anterior abdominal wall, but if this fails artificial inflation of the colon may be resorted to, not as a routine practice, but only in exceptional cases. In the great majority it is superfluous, and in many inadmissible. But where the diagnosis is incomplete, and it is likely to be made more complete by the injection of air into the intestine, then the method may be employed where the patient's conditions permit of it.

Whether or not the enlarged kidney follows the respiratory movements depends upon the adhesions the organ has formed with surrounding parts. In some instances contraction of the diaphragm may communicate movement to the swelling, but, as a rule, the kidney is immobile both during deep respiration and on palpation. A few cases have been recorded of movable cystic, cancerous, or hydronephrosed kidney.

The most important diseases which require to be distinguished from enlargements of renal origin are ovarian and omental tumours, enlargement of the spleen, tumours of the liver, intestinal accumulations, perityphlitic abscess, and ascites, also malignant disease of the colon.

It is in connection with fluid accumulations that most difficulty has arisen. Hydatid cysts, cysts of the liver and spleen, ovarian cysts, ascites, and perinephritic abscess have been mistaken for renal lesions. The history of the case, as showing the direction of growth, and the relationship of the swelling to the bowel, when considered along with the accompanying symptoms, usually clear up the diagnosis.

In ovarian cysts both loins are resonant, the intestine being almost invariably behind. The bowel is pushed aside

so that the growth is in direct contact with the anterior abdominal wall, and is frequently bound to it by adhesions. In a few exceptional cases, however, intestine has been found fixed to the anterior surface of an ovarian cyst, and, on the other hand, occasionally in very large renal accumulations, the intestine gets behind the bulk of the fluid; consequently, the presence of bowel in front does not preclude the possibility of ovarian cyst, nor its absence that of a renal swelling. Excepting these rare cases, the position the bowel occupies in relation to the swelling is the most reliable guide in diagnosis.

In renal lesions the seat of the disease is generally indicated by some urinary disturbance, and in ovarian disease the diagnosis is assisted by the presence of some catamenial pain or irregularity. In renal disease vaginal and rectal examination seldom reveal any change further than depression of the uterus, whereas in ovarian disease the uterus is raised and frequently fixed, and the tumour can be felt in the pelvis. Tumours of the ovary usually make their appearance in the lower part of the abdomen, a little to one side of the middle line, but when increased in bulk they may occupy the whole of the anterior portion of the abdomen. They are, as a rule, movable, and frequently multilocular, in these respects differing from the large renal accumulations of fluid, which are fixed, and generally unilocular.

Ascites, unless when it is limited, may be easily diagnosed from renal swelling. When general, the swelling is symmetrical, and the percussion in both flanks dull—the distribution of dulness varies with position—characteristics which distinguish a collection of serous fluid within the peritoneum from an accumulation of pus or urine in the kidney. Supposing, however, the ascites is limited, the signs mentioned may not be present, and there may be considerable difficulty

in distinguishing by a physical examination the two conditions. But while in such cases the signs during life were equivocal, the concomitant symptoms clearly indicated the nature of the disease.

Perinephritic abscess is not apt to be mistaken for organic disease of the kidney unless the two conditions co-exist. Abscess external to the kidney causes a more diffuse swelling and more lumbar bulging than renal growths, and fluctuation is more superficial. The local surface temperature is raised, and superficial œdema is more marked in the former than in the latter.

In hepatic cysts and solid tumours of the liver, the new formation lies in contact with the abdominal wall, very rarely is bowel interposed; consequently, the liver and the tumour dulness are continuous. These growths increase in size from above downwards, and are nearly always associated with symptoms of hepatic disturbance. Cysts arising from the posterior margin or the concavity of the liver may be very difficult of diagnosis.

Splenic growths are easily distinguished from renal by the fact that the intestine is not in front of them, and generally the sharp and well-defined edge and the notch of the spleen can be felt. The splenic growth is recognised by being movable, especially upwards; by having, unless the organ is greatly enlarged, an area of clear percussion between it and the spine; by seldom causing pressure upon veins, and producing varicocele; by the other symptoms that accompany splenic enlargements—for example, leukæmia, amyloid disease, anæmia, &c.

Tumours or abscess connected with the lumbar or mesenteric lymphatic glands are sometimes very difficult to define. They are, however, usually symmetrical, are not complicated by urinary disturbance, but are associated with symptoms of

intestinal disease, with glandular enlargements elsewhere, or evidence of tubercular disease in other organs.

Fæcal accumulations, fæcal and perityphlitic abscess, are not likely to be mistaken for renal swelling if the symptoms are carefully considered along with the physical signs.

The diagnosis of polycystic kidney from other maladies associated with increased bulk of the kidney may now be discussed.

Increase in the bulk of the kidney is the most important indication of this disease. There is a non-fluctuant swelling in one or both loins; the swelling is usually rounded and nodulated on the surface, not necessarily painful on pressure, slow of growth, does not diminish or increase from time to time, nor is there sudden retention of the renal excretion. But while the augmentation in size may be very great, it is worthy of remark that the organ almost always retains its renal form, however much it may be enlarged. This is an important point in distinguishing cystic diseases from other forms of enlargement of the kidney. The renal diseases most likely to be confused with cystic degeneration are hydronephrosis, pyonephrosis, hydatids, abscess, or tubercular disease of the kidney, and simple or malignant neoplasms. The absence of fluctuation at once eliminates hydronephrosis and pyonephrosis, while to the diagnosis of hydatids of the kidney attention shall presently be directed. In abscess and tubercular disease of the kidney the course of the malady is acute and associated with more or less increase in the size of the organ, and in these diseases the renal form of the swelling is seldom maintained; again, in abscess and tubercular disease there is generally marked elevation of temperature, some pyuria is usually detected, and the swelling in the lumbar region is more marked behind than in cystic disease. Malignant neoplasms

of the kidney, when the growth has attained considerable size, are generally associated with severe pain and persistent hæmaturia, which comes on independently of any direct exciting cause, and may occur at all times whether the patient is moving about or at rest, and when the hæmorrhage commences it is more profuse and more continuous than what is seen in cystic degeneration. Profuse hæmaturia in young children, if repeated and associated with renal enlargement, is very suggestive of malignant disease. Again, in malignant tumours of the kidney the swelling does not maintain the renal form. The disease is rarely found to occupy both sides, and pain is not limited to the lumbar region of the affected side, but generally extends to the chest, across the middle line, or to the hips and lower extremities. Again, in malignant disease the increase in bulk is rapid, and when large in size is often associated with marked distension of the superficial veins of the abdominal wall, a condition I have never seen in cystic kidney.

From what has been said regarding the characteristics of polycystic disease of the kidney, it will be seen that in all essentials it is a slowly degenerative process resembling in its incidents granular disease of the kidney, and, as in the latter affection, its causes are difficult to determine, and the onset is obscure. The disease usually remains latent as far as symptoms are concerned until an advanced stage is reached. The first thing to attract the patient's attention is the increase in the bulk of the organ.

Attention may now be asked to the symptoms other than those caused by the increase of the bulk of the organ which distinguishes polycystic kidney from granular kidney. The absence of dropsy is one of the most marked characteristics of the disease, as distinguished from chronic renal cirrhosis. In none of my cases, even the most advanced, was œdema present,

although in one (Case XV) serous fluid was found in the peritoneum. Dickenson says—"Dropsy, whether superficial or in the serous cavities, appears to be generally absent. A patient under my own care was said to have swelling of the legs; when I saw him there was none. The only recorded case I have met with in which œdema was mentioned, presumably as a result of this disease, was that of the gigantic cystic kidney recorded by Dr. Hare. In this it is probable that the swelling was due more to the mechanical fact of the tumour than to the constitutional influence of the disease. The œdema was most marked on the side to which the renal swelling was nearly limited."

The urine in large polycystic kidney varies according to the stage of the disease. It may have the characteristics belonging to chronic Bright's disease, or the secretion may be strictly normal. Of the one hundred and five cases recorded, in only 40 per cent the urine contained albumen, and in most instances the quantity present was small. The urine is described as copious in amount, pale in colour, and of low specific gravity, 1005 to 1010.

While in the early stages of the disease urinary symptoms are generally absent, as a rule as the disease advances the urine has been found to contain albumen and finely or coarsely granular tube-casts. Hæmaturia was noted in a fourth of the recorded cases. Sometimes it was profuse, in other instances small in amount; the fact just stated differs from what is observed by Dickenson, who says—"It is characterised in most cases by the frequent admixture of blood, often so copious as to call for styptics. Of sixteen cases in which symptoms were present hæmaturia was prominent in eleven; in some it largely contributed to death by the exhaustion it caused; in others, it gave trouble from the formation of coagula." In only one of my cases (Case XV) was hæmaturia present. In

this case the urine was never free from blood. The persistent and sometimes considerable hæmorrhages led me for some time to suspect malignant tumour of the left kidney. The character of the hæmorrhage, and the circumstance that it was associated with a swelling which was steadily increasing, supported this view; while on the other hand, that subsequently the right kidney became enlarged, and was also painful—taken in conjunction with the discovery that the hæmorrhage was from the right kidney only, and that there was evidence of chronic tubular nephritis—these facts made me doubt the accuracy of my first diagnosis of malignant tumour, and incline me towards that of cystic degeneration. The presence of hypertrophy of the left ventricle and increased arterial tension supported this view.

(*b*) Congenital Cystic Transformation of the Kidney.

This condition of the kidney has been placed in a subdivision because of the period of its appearance as well as by reason of the very definite distinction in its pathology. It is of more interest to the morbid anatomist than to the surgeon. I have only met with one instance of this disease, viz., in an infant whom I examined in the Maternity Hospital in 1885.

Case XVII.—*Advanced Congenital Cystic Transformation of the Kidney, with Malformation of Pelvis and Ureter.*

In this instance the kidneys were swollen so as almost to equal in bulk the healthy adult kidney. Both organs presented the appearance of advanced cystic degeneration, but the cysts were extremely small, and contained urinary matters, and in this respect differed from the cysts found in adult kidneys. On one side the pelvis was absent, and on the other the ureter was obstructed, so that in both the escape

of urine from the kidney was impossible. Both organs were so soft and gelatinous that microscopic examination was extremely difficult.

In small sections which were made the glomeruli in some parts appeared to be healthy, in other parts they were swollen and enclosed in what appeared to be a delicate fibrous capsule. In no part of the sections was there any marked excess of fibrous tissue, but in several areas there was marked compression of the delicate uriniferous tubules by the cysts. The epithelial lining of the uriniferous tubules was swollen and granular, and where tubules were not dilated into cysts they were choked by swollen and granular epithelium.

The cysts were most abundant in the cortex, but were also found in the medulla; in this case it was evident that the cystic transformation of the kidney was due to obstruction of the urinary exit outside the parenchyma of the organ.

According to Virchow, cystic transformation may be due either to retention of the excretion as a consequence of embryonic nephritis causing narrowing of the uriniferous tubules, or to impaction of the straight tubules with deposits of uric acid, both of which ultimately lead to obstruction within the parenchyma of the kidney, and perhaps also to atrophy and obliteration of the pelvis. On the other hand, Köster assumes that the primary lesion is a malformation of the lower urinary tract, and this view is supported by the circumstance that congenital cystic kidney is frequently associated with malformations of other parts. For example, Hausinger observed a case of cystic disease of the right kidney associated with congenital absence of the lower extremity and the female genitals on the same side of the body, while on the opposite side nothing abnormal was found. On the other hand, cases have been recorded in which cystic transformation of the kidney has been observed in the fœtus and not

associated with any disease or malformation of other parts of the body. In such instances the presence of the lesion in the kidneys can only be accounted for by adopting Virchow's theory.

In such cases, death and premature expulsion of the fœtus may occur, or abdominal swelling produced by the disease may act as a hindrance to birth, which can only be overcome by operation. In other instances the abdominal swelling has so interfered with the respiration and circulation that death has occurred almost immediately after birth.

(*c*) Paranephric Cysts.

A careful distinction must be drawn between paranephric cysts and single cysts which form in the substance of the kidney, as, for example, in Case XIII. Many writers have failed to make this distinction, so that cysts not always of the same kind have been classed together; for example, large simple peripheral cysts may develop in the substance of the kidney, and by their bulk displace the proper renal tissue, so as to cause a bulging of the capsule, and the cyst may even penetrate as far as the pelvis of the kidney although it fails to communicate with it.

True paranephric cysts are formed external to the capsule of the kidney.

Dickenson describes a preparation from St. George's Hospital Museum in the following terms :—

"A large cyst protruded from the back of the pelvis, which is generally but little dilated, and is scarcely unnatural except that its posterior wall opens into the cyst behind it. The ureter, which was unobstructed, opened into the cyst, so that this cavity lay in the course of the urine, between the pelvis and its duct. The cyst resembled in extent, and somewhat in

shape, a distended stomach, and held above four pints of clear albuminous fluid.

"The abdominal tumour was first noticed when the patient, a woman of the age of 37, was brought into the hospital in consequence of having been knocked down in the street. She fell down, became unconscious, and died in a few hours from causes which the *post-mortem* imperfectly explained. She had emphysema and bronchitis."

The case just described occurred in an adult.

Mr. Cæsar Hawkins, in the *Medico-Chirurgical Transactions*, vol. xviii, describes a similar cyst of fœtal origin. The cyst contained five pints of translucent fluid, which on examination was found to be free from all urinary constituents. The cyst lay behind the kidney, and, while being closely attached to the organ, it showed no evidence of having originated in the kidney substance. There were, however, two small openings into the pelvis which afforded a communication between the cyst and the cavity of the kidney. A prolongation of the cyst passed under Poupart's ligament and through the femoral ring.

Case XVIII.—*Large Paranephric Cyst on the Posterior Aspect of an Amyloid Kidney—Cyst not communicating with Renal Pelvis.*

In 1884 I made a *post-mortem* examination in a case of Dr. Wood Smith's which was admitted to the Royal Infirmary, and died from amyloid disease on 7th July, 1884. The cyst of the kidney had not been suspected during life, but at the inspection a thin-walled cyst the size of a goose's egg was found lying posterior to the left kidney, and completely outside the fibrous capsule. The contents of the cyst were clear, with specific gravity of 1005, and contained about $1\frac{1}{2}$ per cent of albumen, a trace of chloride of sodium, but no organised urinary constituents. From the pressure of the

cyst there was slight flattening of the posterior aspect of the kidney. The *post-mortem* examination was limited to the kidneys only, by request. Microscopic examination demonstrated amyloid infiltration of the kidneys. The wall of the cyst was about one-sixtieth of an inch thick, and was composed of fibrous tissue only, and even although a careful examination was made of various parts no indication could be discovered as to the tissue from which the cyst originated.

So few cases of paranephric cyst have been recorded that we can say little as to the diagnosis or symptoms, but probably they closely resemble those found in Case XIII.

(*d*) Cysts due to the Presence of Parasites.

The presence of echinococcus in the kidney gives rise to true hydatid of the kidney. Cysts due to the presence of echinococcus of the kidney are, however, rare in this country, almost all the cases and specimens described by the older writers being in reality not hydatids but cystic degeneration of the kidney. For example, in the Hunterian Museum of the University of Glasgow, a number of cases are entered in the catalogue as being hydatid of the kidney, while in reality there is not a single specimen of cysts due to the presence of the parasite, so far as I discovered when I went over the Museum eight years ago. Consequently the statistics on the subject are not very reliable, unless the specimens have been examined with a clear distinction made between hydatids, properly so-called, and the form of cystic transformation of the kidney which I have described above.

Hydatid disease differs essentially in its pathology from the lesions which we have been considering up till the present. These cysts of the kidney are rounded in form and fluctuant, and when the parasite is seated in the cortex, or immediately

beneath the capsule, the growth may attain considerable dimensions. The echinococcus has a great tendency to rupture into the renal pelvis, the renal tissue in which the cyst is embedded tends to undergo atrophy and degenerate changes, and not infrequently there is an increase in the fibrous tissue of the organ.

The cysts vary in size from extreme minuteness to a magnitude sufficient to hold several pints of fluid. The cysts may occupy one or both kidneys, or they may be limited to one end of the organ only, while the remainder may be healthy. Any part of the kidney may be attacked.

When the parasite develops in the pelvis of the organ the growth may attain such a size as to be palpable during life, and when of very large size it is liable to be mistaken for an ovarian tumour. As a consequence of pressure of the new formation in the pelvis of the organ, the parenchyma of the kidney may become entirely destroyed.

In this country hydatids of the kidney are rarely seen, and they are also uncommon in America; while in Iceland, in some parts of Germany, and in Australia the disease is frequently met with.

Two specimens are to be found, however, in the Museum of the Western Infirmary. One was sent by Dr. J. Lindsay Steven and Dr. Fotheringham; the other was from a patient who died under the care of Dr. Gavin P. Tennent.

Neisser, who collected no less than 986 cases of hydatids in man, states that of all these the kidney was involved in only 80; and Davaine has shown in his elaborate statistics that, in 566 cases of echinococcus in man, the kidney was affected in only 30 instances. The researches of others corroborate the accuracy of these statements. When it is borne in mind that echinococcus may attack any portion of the body, one would expect the kidney to be more frequently involved in

the disease. In connection with this point Ebstein remarks:—"The cause of the kidney being relatively less frequently involved is to be found in the fact that the young animals can find their way out of the stomach more rapidly and easily into the liver. Of the reasons why in other cases, however, they wander directly into the kidneys, and at the same time often leave all the other organs free, we are unable even to form a supposition."

Dr. Roberts shows the following results from an investigation of 63 cases in which hydatids were found in the kidney, or passed by the urethra:—In 47 cases the cyst opened into the pelvis of the kidney; in 1 case, into the pelvis of kidney and lungs; in 3 cases, into the pelvis of kidney and intestine; in 1 case, into the pelvis of kidney and stomach; in 1 case, into lungs alone; in 8 cases, did not open at all; in 2 cases, opened artificially. It will be seen from these figures that in 52 out of 63 cases hydatids were discharged by the urethra.

Case XIX.—*Hydatid Cyst of the Left Kidney.*

The specimen was removed from a patient who had been under the care of the late Dr. Scott Orr (1884) in the Glasgow Royal Infirmary, and who died at his own home. While pathologist to the Infirmary I was asked to make a a *post-mortem* examination of this case. My notes of the clinical history are very imperfect. The patient suffered from symptoms of chronic interstitial nephritis of six months' duration. A tumour also was observed in the left lumbar region, there was some œdema of both lower extremities, and the urine contained a varying quantity of albumen, but the amount was never considerable. On percussion the dulness extended from the costal margins to the crest of the ilium, but no fluctuation was detected.

A fortnight previous to death the patient was suddenly

seized with a severe pain in the left lumbar region and along the line of the ureter, and, following relief of this pain, some globular masses were noticed by the patient in the urine. The exact nature of these masses was not ascertained, but probably they were echinococcus cysts.

At the *post-mortem* examination, made on the 13th December, 1884, the left kidney was found to be displaced by a large globular cyst which occupied the upper portion of the organ, the cell contents were pultaceous, and contained a large quantity of fat; the wall of the cyst was soft and irregular, and was continuous with the pelvis of the kidney, but was clearly separated from the renal parenchyma. On section the wall presented the characteristic stratified appearance of hydatid cyst, and on microscopic examination echinococcus heads were found.

The symptoms of renal hydatids are often very obscure. The growth may attain considerable dimensions without its presence being evinced either by pain or febrile symptoms. This is so when the cyst does not communicate with the pelvis of the kidney. In such cases there is no interference with the elimination of the renal excretion. In many, however, the cyst ruptures into the pelvis, when obstruction to the flow of urine and pain are early symptoms. Beyond the presence of the cyst contents the urine is generally normal, unless the disease is complicated by pyelitis or some organic disease of the organ. When rupture of the cyst occurs, the fact is evinced by the presence of fragments of the cyst in the urine, and occasionally by the existence of pyuria or the presence of renal colic.

The physical signs are those of renal tumour, but while this is so, as a rule hydatid cysts vary more than other tumours in their position with reference to the colon.

This is probably explained by the circumstance that cysts, during their early stage, only involve a small portion of the

organ, and in their development extend outwards, dissect the peritoneum from the abdominal wall, and press the colon towards the middle line. They seldom rupture into the peritoneal cavity. Their contents may, however, escape into the respiratory passages through the diaphragm or into the pleura, they may also open into any of the hollow abdominal viscera, or by suppuration the contents of the cyst may be discharged externally.

The diagnosis is in some cases extremely simple, in others almost impossible. When marked renal colic occurs, followed by the discovery of echinococcus vesicles in the urine, the diagnosis is almost certain; and if the indications just mentioned be accompanied by the physical signs of renal tumour, and simultaneously with, or following the attack of renal colic, there is a sudden diminution in the bulk of the swelling in the loin, the diagnosis is absolutely certain. In doubtful cases, where the cyst has not ruptured into the renal pelvis, and the urine does not give evidence of the character of the lesion, the fact that it is renal may be demonstrated by puncturing the cyst and withdrawing a portion of its contents. This procedure has a double advantage; not only does it clear up the diagnosis, but it is also a useful means of treatment. The fluid so procured has a specific gravity of about 1009 to 1014, its reaction is neutral, it is clear, colourless, transparent, and does not, as a rule, contain albumen. But while this is generally the case, the presence of albumen does not prove the fluid to be not hydatid, as in some instances the contents of a hydatid cyst are albuminous. This is especially apt to be so if the cyst has been previously opened.

The fluid usually contains a quantity of chloride of sodium, and may have suspended in it cholesterine crystals, uric acid, triple phosphates, oxalate of lime, or hæmatoidin crystals. For the purpose of examination the urine should be placed in

a conical glass, and set aside for some hours to allow any hooklets that may be present to deposit. The presence of these bodies is pathognomonic of hydatid disease, but it requires other evidence before we are entitled to conclude positively that they are of renal origin. This is so even when they escape by the urethra, for in a few instances echinococcus cysts have been known to rupture into the bladder and other portions of the urinary tract when the disease does not involve the kidney. In such cases the nephritic colic, which usually accompanies renal hydatids, is absent.

The diagnostic significance of so-called hydatid fremitus, when it can be obtained, is great, and it may be elicited when the tumour is tense. The cyst should be compressed by the second finger of the left hand, and a slight sharp tap should be given to it with the finger of the right hand. The finger should be allowed to rest for a short time, when a peculiar vibratory thrill will be communicated to the left hand. This is hydatid fremitus. When felt it is of great value, but its absence is of no significance. Its duration is uncertain, sometimes brief, but frequently prolonged.

When the cyst ruptures into the renal pelvis the course of the disease is generally favourable. Notwithstanding, however, cases have been recorded where the patient has continued to pass vesicles at longer and shorter intervals for twenty or even thirty years. Davaine mentions a case of a woman who suffered from attacks of renal colic, accompanied by the escape of cysts by the urethra during a period of twenty years. Death may ensue from rupture of the cyst into some important viscus, or by a solitary kidney becoming the seat of the disease. When the tumour is small in size, and located close to the pelvis, the prognosis is favourable. This is especially so if the kidney be the only organ involved. When the tumour attains considerable size, or when it shows a tendency

to suppurate, the prognosis is less favourable. If, however, the pus is permitted to escape freely, danger to life is proportionately diminished.

Treatment.—We now come to consider the general question of treatment of cystic diseases of the kidney. Single cysts of the kidney seldom require treatment at the hand of the surgeon; it is only when they attain such dimensions as to cause pressure symptoms, as, for example, in Case XIII, that one is justified in resorting to an operation. In the case referred to, considerable doubt was entertained as to the diagnosis between a simple cyst and a hydronephrosis, but by cutting down on the kidney the diagnosis was cleared up, and the malady cured. Such cases are, however, rare.

The treatment of general cystic degeneration of the kidney generally falls to the physician rather than to the surgeon, whose aid is seldom asked in such cases when the diagnosis has been correctly made; but, as I already pointed out, now that more attention is being directed to surgical diseases of the kidney, it is well that such maladies as general cystic degeneration should be taken into account in forming a diagnosis, otherwise serious errors may be made.

Upon many patients affected with this disease nephrectomy or nephrotomy has been performed under a mistaken idea of the nature of the case. The earlier operators mistook cystic degeneration of the kidney for ovarian disease. As cystic degeneration is usually bilateral and associated with chronic interstitial nephritis, it is not a disease calling for nephrectomy, nor, seeing that the cysts are multilocular and widely distributed throughout the organ, is the patient likely to be benefited by tapping or nephrotomy. In cystic degeneration surgical interference is contra-indicated.

It is only in cases where the cystic kidney is moderately

small in size and where symptoms of interstitial nephritis are absent that nephrorrhaphy may be resorted to, to fix a movable organ when it is the cause of marked disturbance. In Case XIV the displaced cystic kidney was so freely movable that occasionally the displacement gave rise to a transitory hydronephrosis, and on this account an operation was resorted to, but I may safely say that in the large majority of cases of cystic degeneration of the kidney operative interference is to be condemned.

Concerning hydatid disease of the kidney I shall only allude to treatment as applying to the cyst so as to aid its evacuation. No internal medicaments appear to influence the life history of the parasite or the bursting of the cyst, but after rupture has taken place it may be of advantage to facilitate the evacuation of the cyst by washing out the parasites. This is best done by ordering the patient large quantities of fluids, so as to induce diuresis. With a similiar object in view gentle friction in the course of the ureter, applied either by the patient himself or by an attendant, may palliate the pain of renal colic, and at the same time facilitate the progress of the cysts from above downwards, and, during the attack, if the pains be very severe, warm baths, hot fomentations, the subcutaneous injection of morphia, or the exhibition of other preparations of opium may be found useful.

Not unfrequently the ureters become dilated, and thereby the progress of the parasite is facilitated, so that such considerable masses may escape into the bladder that difficulty may be experienced in the passage of the cysts into or along the urethra. If they cause interference with micturition, then means must be adopted to remove them.

Should cysts become impacted in the ureter, or considerable pain and inconvenience be suffered, or if the cyst increase in bulk so as to cause danger to life, without its contents

escaping *per urethram*, the question of operative interference may be raised. Various methods have been proposed; the simplest, and probably the most efficacious, is to cut down upon the cyst, evacuate its contents, and stitch the edges of the cyst to the parietes. This operation has been performed frequently and with satisfactory results. Thiriar, Imlach, and Péan have recorded recoveries after nephrotomy, but in a nephrectomy by Spiegelberg the patient died from collapse.

Because of the success of puncture of hydatids of the liver, the same treatment has been proposed for hydatids of the kidney, and it is true that in some favourable cases a surgical operation of this kind has been followed by a diminution in the size of the cyst.

Chapter IV.

CLASSIFICATION OF DISEASES CAUSING HÆMATURIA: METHODS EMPLOYED IN MAKING A DIFFERENTIAL DIAGNOSIS.

The appearance of blood in the urine during micturition is a symptom of a large number of different lesions, and, as seen in surgical practice, may have its origin in any of the divisions of the urinary tract. Hæmaturia may be due to (*a*) lesions of the renal parenchyma or the pelvis: (*b*) disease of the ureters: (*c*) disease of the bladder: (*d*) disease of the prostate: (*e*) disease of the urethra: and (*f*) disease of the testicles. I shall endeavour in the first instance to discuss in a general way the characteristics of the urine in local lesions of the urinary tract in which hæmaturia is a prominent symptom, and will describe in detail the exact methods which should be employed in making a differential diagnosis. Having done so, I shall classify the lesions of the urinary tract which are commonly associated with hæmorrhage, and then describe in detail and illustrate fully by selected cases the etiology and symptomatology of renal hæmaturia. Only hæmaturia from lesions of the kidney will be illustrated by cases. I shall now refer to lesions of other portions of the urinary tract only in so far as it is necessary for differential diagnosis.

We may classify the diseases of the kidney commonly associated with blood in the urine under the following

heads:—1. Traumatic lesions—(*a*) from injury and (*b*) from calculus. 2. Passive hyperæmia—(*a*) pressure on the renal veins; (*b*) torsion of the renal veins; and (*c*) reflex spasm of arterioles. 3. Inflammatory hyperæmia—(*a*) nephritis, acute and chronic: (*b*) tuberculous disease: and (*c*) cystic degeneration and hydatids. 4. Tumours of the kidney. In the old nosological system of Vogel hæmaturia denotes a hæmorrhage from the kidney exclusively; but the name has been applied with different latitude of meaning by different writers. According to its etymological sense it should be restricted to cases in which blood is effused from the vessels in the kidney, ureters, or bladder, and discharged along with urine, excluding from the definition urethral hæmorrhage in which the blood flows by drops or in a continuous stream from the orifice of the urethra, and which is not properly a mictus cruentus. Every flow of blood from the urethra ought not to be considered a hæmaturia: a hæmorrhage having its starting-point in front of the muscle of Wilson ought to be distinguished from a true hæmaturia. The pathological conditions which are associated with the appearance of blood in the urine are very various and numerous: and, while the great majority of these maladies are such that they naturally come under the cognisance of the surgeon, many other cases of hæmaturia do not come under our consideration, as they belong strictly to medical rather than to surgical practice. For example, hæmaturia may be an accompaniment of hæmophilia, septicæmia, typhus, enteric, or malarial fevers, small-pox, scurvy, or purpura; or it may be the direct consequence of poisonous agents, such as cantharides, alcohol, turpentine, phosphorus, and arsenic. Red urine is sometimes passed by patients who have taken sulphonal in large doses or for a long period. The Burgundy-red colouration is not due, however, to blood, but to the

presence of abnormal pigments, urohæmatoporphyrin or its allies.

Eliminating such sources of hæmorrhage, and considering only those of a purely surgical nature, it may be said that the presence of blood in the urine indicates disease in some portion of the urinary tract: the red corpuscles may escape from the capillaries of the kidney, and become mixed with the urine as it is secreted, or the urine may escape from the collecting tubes of the kidney in the normal state, and afterwards become tinged with blood from the calyces, the ureters, or the bladder. How, then, are we to form a differential diagnosis of the source of the hæmorrhage? This may be done in several ways. First, by observing (*a*) the physical characters of the urine and of the blood-clot; (*b*) the admixture of other deposits with the blood; (*c*) the time at which the blood appears in the stream: (*d*) the frequency and duration of attacks; and (*e*) the effects of movements and exercise, or of complete rest in the course of an attack. Secondly, by collecting the urine separately from the two ureters, or by observing blood escaping from the orifice of a ureter. Thirdly, by estimating the quantity of hæmoglobin, and comparing it with the amount of albumen in the urine. Fourthly, by carefully considering all the other accompanying objective and subjective phenomena. In acute diseases the diagnosis between hæmaturia of renal and vesical origin is usually easy; but it is frequently otherwise in chronic affections. In the former the objective and subjective phenomena are so pronounced as clearly to indicate the organ which is affected: in the latter the most careful observation of minute details is often necessary in order to determine the seat of the lesion, and in not a few instances examinations conducted by different observers may lead to disagreement as to whether the secreting, the conducting, or

the collecting portions of the urinary system are at fault. I shall endeavour to sketch and illustrate by cases under the divisions just enumerated a systematic inquiry respecting the signs and symptoms accompanying hæmaturia, in so far as they may lead us to a differential diagnosis of the source of the blood.

I.—(*a*) Physical Examination of the Urine and the Circumstances connected with the Presence of Blood in the Evacuation.

The following questions must be inquired into and answered:—What is the colour of the blood? Is it intimately mixed with the urine, and is the whole stream equally colourised? Is the quantity of blood augmented by exercise or diminished by rest? Have clots been seen, and what is their form? Are there tube-casts or blood-casts to be discovered, or are there other deposits found in the urine? Are the attacks frequently repeated and of short duration, or are they protracted? These are some of the most important points to inquire into, and presently I shall discuss them in detail. The colour imparted to the urine by the addition of blood varies greatly in intensity and shade—from a pale rose colour to a bright red like red-currant syrup mixed in water, to a dark red, to a colour simulating porter, or to a brown colouration not unlike coffee. As a general rule, however, it may be stated that the nearer the source of hæmorrhage is to the external orifice of the urethra the less is the blood altered in appearance. Sometimes, however, as in cases of tumour of the kidney, the quantity of blood derived from an organ may be so large in amount, and may be expelled so rapidly after it has escaped from the vessels, that little change may be

observed in its colour. Again, as will be illustrated presently, in some cases of rupture of the kidney from direct violence, the urine may be of a bright red colour, the blood having undergone very little change: but if there is no history or symptoms pointing to tumour of the kidney, or to rupture of the organ from injury, the above statement may be accepted as correct. On the other hand, when the hæmaturia is of vesical origin, the first quantity of urine passed may present a normal appearance, especially if the patient has been for some time at rest in a recumbent posture, and the urine is passed while the patient is in bed; but in such circumstances, as the bladder empties itself, the urine gradually becomes more and more tinged, till finally the last drops evacuated may be almost pure blood. This is to be especially noted in cases of tumour of the bladder and of vesical calculus, also in passive hyperæmia of the bladder. In passive hyperæmia probably the engorgement of the vesical veins is greatly augmented by the process of muscular contraction, the efflux trunks being compressed by the muscular trabeculæ through which they pass on their way to join the plexus of veins on the serous surface of the bladder. When the bladder is moderately full the veins are distended and gorged with blood: but when an expulsive effort is added to the already considerable tension, the weak capillary walls give way, and there may be considerable oozing of blood from the mucous surface without the appearance of any gross lesion when the bladder is examined with the cystoscope. As a general rule, in hæmorrhage from the bladder the urine is mixed with a considerable quantity of mucus, and is of a bright florid colour; but, if long pent up in the viscus, it may assume a dark colour dependent upon the reaction of the urine, which in such cases is usually alkaline. When due to vesical calculus the hæmorrhage is

increased by exertion, and in cases of tumour of the bladder the bleeding is always worse after an attempt has been made to examine the bladder by instruments. When the blood is from the kidneys or the ureters it is generally intimately mixed with the urine, to which it imparts a dark smoky colour, unless when, as in Cases II and XXVI, the blood issues in considerable quantity from the pelvis of the kidney, and flows rapidly along the ureter, distends the bladder, and escapes without undergoing much change. While it is true that usually blood of renal origin is freely mixed with the excretion which presents a smoky or coffee colour, too much importance must not be attached to these appearances, as they do not depend so much upon the source of the blood as upon the reaction of the urine itself—for example, in some cases of enlarged prostate and chronic vesical catarrh.

In cases where there is considerable residual urine, freshly oozed blood may rapidly become smoky: and while at one time the urine may be clear and of a bright colour, while the corpusles may separate rapidly as a deposit, on other occasions the colouring matter may be rapidly dissolved, and the urine may present a distinctly smoky appearance. R. von Jaksch states that "when blood-cells are intimately mixed with the urine in such a way that, though they present a large quantity of deeply-tinged fluid, they do *not* form a sediment after many hours' standing, it may be inferred that the hæmorrhage took place in the substance of the kidney or in the renal pelvis or ureters. If under these circumstances they are seen with the microscope to be profoundly altered, having lost their colouring matter, and presenting the appearance of pale yellow rings, the further conclusion results that the blood has been effused from the kidney itself, and the symptom points to acute nephritis or

to a fresh exacerbation in the course of chronic nephritis." To this statement I cannot assent. In many cases I have seen, on careful observation, the urine of individual patients vary greatly from day to day, on some occasions presenting the characteristics described by Jaksch, and at other times an altogether different appearance, while the hæmorrhage was proved ultimately not to be of renal origin.

Blood having escaped from the vessels, its fibrous constituents may coagulate into firm clots, which during their formation may entangle some of the histological elements of the structures in which they lie, or by their firm appearance, form, or bulk may indicate the source of the hæmorrhage. Clots are seldom noticed in the urine unless in cases of abundant hæmorrhage: they may be few in number or numerous: generally they are soft in consistence, and when small in size they are easily dissolved in the urine, and consequently, if not looked for immediately after micturition, they may be lost. The form of the clot may be ovoid, or may be long and worm-shaped, or may resemble in appearance a well-gorged leech. As to colour, they are generally dark red, but may vary considerably, sometimes being black, bright red, or they may become partly or wholly discoloured —spotted red in a greyish background, or entirely grey. When the clot is large the hæmorrhage is usually, but not invariably, from the bladder: the clots may be so huge that they cannot pass along the urethra without being broken up either by the repeated contraction of the bladder or by means of instruments. These clots are generally very irregular in form and size: they may be so large as to be described by the patient as like masses of liver, but here again a conclusion must not be drawn from the size and appearance of the clot. It is generally said, and probably truly said, that these large masses of blood-clot are due to

a vesical lesion: but many cases have been recorded, and some examples will be given presently, where large clots have been formed in the bladder and evacuated, where the hæmorrhage has been clearly due to a renal lesion. The coagulum may make a complete cast of the pelvis or of the calyces. Three years ago, in a case of very acute parenchymatous nephritis, I had sent to me a clot of blood which was almost a complete cast of the pelvis and a portion of the ureter of one kidney: and I remember many years ago, in an exactly similar case, finding at a *post-mortem* inspection both pelves occupied by blood-clot which extended down to, and protruded from, the orifices of the ureters into the bladder. Rounded clots corresponding to the diameter of the ureter may escape, or leech-like ovoid casts may be taken of the first part of the urethra, or long bougie-like coagula from its anterior part. While the presence of considerable clots is usually, though not always, conclusively against the idea of the hæmorrhage being from the secreting substance of the kidney, the absence of clots visible to the eye proves nothing. If the passage of a long worm-shaped blood-clot is preceded by a temporary cessation of the hæmaturia, and its escape followed by a recurrence of the bleeding, this proves almost to demonstration that the clot has been plugging one ureter, and if, in addition, the clot is of such a size as to support the idea of being a mould of the ureter, the evidence is conclusive as to the source of the hæmorrhage. The hæmorrhage has been from the kidney, and blood has coagulated in the ureter and has completely plugged it: the coagulum has then become shrunken, while at the same time an accumulation of urine has taken place in the pelvis, and caused dilatation of the ureter until a point has been reached where the onward pressure from above is so great that the clot has been forced out into the

bladder along with an accumulation of blood-stained urine. I observed this lately in a case (Case XX) where palpation of the left kidney always brought on hæmaturia, but when the patient was left at rest the blood disappeared. The microscopic appearance of these clots varies according to their age and the changes they have undergone since coagulation has occurred. If the clot is freshly formed the blood corpuscles present practically a normal appearance, and are seen to be well-coloured and embedded in an amorphous or slightly granular matrix of fibrin: but if the clot is old, and especially if it is small in size, the hæmoglobin will be seen to have dissolved out, and the red blood corpuscles to be represented only by little colourless rings from 3 to 5 micro-millimetres in diameter. These fragments of discoloured coagulated blood have sometimes been mistaken by microscopists for portions of tumours. I have had frequently sent for examination fragments of bleached blood-clot in the belief that they were portions of malignant tumours, especially sarcomata. The size of the cells, however, and the absence of nuclei, as well as the behaviour of sections when acted upon by staining agents, clear up the diagnosis. In several cases, the details of one of which will be described presently (Case XXIX), on examination with the cystoscope, one ureter was found to be blocked by a coagulum which protruded from the orifice of the ureter and hung into the bladder, not unlike a small worm hanging from the end of a fishing-hook. It was of a dark reddish-grey colour and firm consistence, being evidently some days old. It was so firm that the examination of the bladder and the movements of the cystoscope disturbed it, and its dislodgment was immediately followed by a copious flow of blood from the previously obstructed ureter. In renal hæmaturia minute coagula, casts of the uriniferous tubules, may

be discovered in the urinary sediment by the microscope, and may give evidence by their form and shape whence they are derived. In this form of hæmaturia the number of blood corpuscles is no criterion of the quantity of albumen in the urine, whereas in hæmorrhage from the conducting or collecting portions of the urinary tract, provided there is no pus in the urine, the number of red corpuscles or the amount of hæmoglobin may be accepted as the measure of the quantity of albumen contained in the excretion.

(*b*) The Admixture of other Deposits with the Blood.

In many cases of hæmaturia the only abnormal constituent in the urine is blood, while in other cases it is mixed with pus, mucus, tuberculous material, portions of tumours, or micro-organisms, the detection of which throws considerable light on the etiology of the malady. The mixture of the blood with deposits of another kind requires only to be mentioned here, as space will not permit me to enter into a detailed description of the various deposits which may be found. The three most common, however, I may mention —namely, pus, mucus, and tuberculous *débris*. If the urine is placed in a conical glass and allowed to stand for a few hours, and the glass is then held up to the light, if pus is present in any great amount the deposits will be found in distinct layers like geological strata; the bottom of the glass is occupied by a yellowish deposit, which may be more or less blood-stained pus, or, in some cases of renal pyuria, the pus may carry down almost all the blood corpuscles, so as to leave an almost quite clear supernatant fluid. When mucus is present, on the other hand, not uncommonly the blood corpuscles may be thrown down first, forming a layer

at the bottom of the vessel, and following upon this may be seen a layer of glairy gelatinous material, which may have a reddish tint, or may contain a multitude of minute bloody streaks which intersect it and penetrate into all parts of this gelatinous layer. In such cases the hæmorrhage is usually due to some lesion in the bladder, and the presence of such an amount of mucus is generally indicative of a more or less acute vesical catarrh. The tuberculous deposit can only be distinguished by microscopic examination, by the cultivation of tuberculous bacilli, or by inoculation experiments. Beyond demonstrating the presence of blood-casts of the uriniferous tubules, the microscope may reveal the existence of other elements of consequence in the deposit. For example, the character of the epithelium as derived from the renal parenchyma, from the pelvis, the ureter, or the bladder may greatly assist one in diagnosis; or, on the other hand, should the urine contain small fragments of tumours, parasites, or bacteria, the hæmorrhage may be explained.

(*c*) The Time at which the Blood appears in the Stream.

In order to ascertain the precise moment at which the blood appears in the stream it is necessary for the surgeon to see the patient urinate, and to observe whether the colouration is equal during the whole continuance of micturition, or is more abundant at the beginning or at the end of the act. The appearance of blood at the beginning of micturition, the remainder of the flow being clear, may be an indication of two distinct conditions—the lesion is either in the prostate close to the neck of the bladder, or a malady or injury is present in the urethra. In some

lesions of the prostate the blood may pass into the urethra and accumulate there: so also in lesions of the first portion of the urethra the blood may flow backwards into the bladder and mix with its contents. When the blood originates in the urethra and accumulates there, or when it escapes from the prostate and flows into the urethra, the hæmaturia is limited to the beginning of micturition; but if the quantity of blood is great, and flows backward into the bladder and mixes with its contents, then the whole of the urine becomes more or less coloured. Again, in a lesion at the neck of the bladder giving rise to hæmorrhage, the hæmaturia is not limited to the beginning of micturition, but blood is also observed to escape at the end of the act. This is easily explained. Between the acts of urination the blood accumulates in the urethra or close to its internal orifice, and is expelled with the first few drops of urine only, that following being clear, but again, before complete contraction of the bladder occurs, a fresh hæmorrhage is induced, which shows itself in the urine last ejected. When the hæmorrhage is due to injury or disease of the urethra, the nature of the lesion is generally clearly indicated by the circumstance that the blood is observed to escape quite independently of micturition; sometimes, indeed, blood is seen to flow from the meatus spontaneously. In cases of tumour of the bladder, and also in vesical calculus, the hæmorrhage is most profuse at the end of micturition.

(*d*) The Frequency and Duration of the Attacks.

While nothing absolutely definite can be ascertained by a close observation and study of the frequency and duration of the hæmaturiæ, still considerable help may be got in this way to aid in a diagnosis. For example, in many cases of

renal hæmaturia the blood may suddenly appear, and just as suddenly disappear, soon to be followed by a profuse recurrence: such sudden tranformations are in some cases accompanied by the expulsion of long worm-shaped clots, and in such instances we may reasonably conclude that the sudden clearing of the urine has been due to the ureter being obstructed. The blood has coagulated within its lumen, and when the clot becomes displaced a fresh and often apparently very profuse escape of blood is observed. The same sudden appearance and disappearance of blood has been observed in cases of movable kidney with torsion of the renal veins (see Cases I and II): also in cases of renal calculus (see Cases XXVIII and XXIX). When hæmaturia comes on without being evidently provoked we may generally surmise that the lesion giving rise to it is a serious one, although we may not be able to judge its site. In cases of tumour of the bladder the presence of blood is generally very persistent, without intervals, and of long duration, so that the patient may become very anæmic from loss of blood. Again, on the other hand, we meet with cases where hæmaturia more or less profuse has recurred at frequent intervals: but the duration of the attacks has been short, and the intervals between them marked by complete absence of any blood in the urine. Sometimes there may be periods of relief extending over several weeks or even months, and usually any fresh recurrence of bleeding can be explained by excessive exercise or unwonted freedom of movement on the part of the patient. If these conditions are associated with the absence of vesical symptoms, the strong presumption is in favour of the hæmorrhage being renal in origin, and against the hypothesis that the blood is flowing from an ulcerated surface: the total duration of the symptoms is also an important guide to the benign or malignant nature

of the malady giving rise to it. The long presence of a stone in the renal pelvis may, after causing occasional hæmaturia for years, be followed by the formation of a carcinoma. I published a case of this kind,[1] in which there were symptoms of renal calculus for ten years, pain in and hæmaturia from the left kidney, albumen, and tube-casts from the right kidney. Within six months of death symptoms developed pointing to malignant disease, from which the patient died, and *post-mortem* the left kidney was found to contain six oxalate of lime calculi, the pelvis and calyces were much dilated, and the upper half of the kidney was occupied by an epithelioma (see Case XXXIII).

(*e*) The Effects of Movement or Exercise or of Complete Rest in the Course of an Attack.

When complete rest is taken, hæmaturia due to the presence of stone in the renal pelvis, in the bladder, or in the prostate is generally more or less relieved; so also in hæmorrhage observed in cases of movable kidney, or in passive hyperæmia of the kidney resulting from pressure on the renal veins. In such cases it is repeatedly observed that the blood is most abundant in the urine at night when the patient has been taking active exercise during the preceding day, while at the same time the pain in the renal region or irritability of the bladder is increased. It must, however, be also borne in mind, in exceptional instances, that in hæmaturia from an abraded surface, as in carcinomatous or tuberculous ulceration, or in senile prostate, the bleeding occasionally may not be increased by exercise; but, as a rule, if the hæmaturia persists in spite of prolonged rest in bed, and especially when the bleeding is

[1] *The Scottish Medical and Surgical Journal*, vol. i, p. 45.

more abundant during the night than at other times, carcinomatous, sarcomatous, or tuberculous ulceration is to be looked for.

II.—By Collecting the Urine separately from the Two Ureters, or by observing Blood escaping from the Orifice of a Ureter.

Various procedures have been employed to ascertain whether the blood originates in the bladder or flows into it from one of the kidneys, and methods have also been devised to ascertain the nature of a vesical lesion. Examination of the bladder by means of the sound, the catheter, or with the finger have been at different times suggested and carried out in practice. When one reads Sir Henry Thompson's[1] description of how exploration of the bladder with the finger should be carried out, the marvel is that the injury done to the patient was not appalling. He introduced the *left forefinger into the rectum* as a guide to the incision of the bladder, and when the incision was completed the same finger (*the left index*), presumably without being cleaned, was used in exploring the bladder. Sir Henry Thompson[2] went further than this, and proposed that portions of a growth might be removed from the main mass by means of a lithotrite and submitted for microscopic examination, surely overlooking the fact that pieces of a growth removed by a crushing instrument must have lost their histological characteristics, and hence been rendered valueless for diagnostic purposes. Again, Kuster has employed a curette and Chismore used a calculus aspirator for diagnostic purposes. The use of such imperfect methods is now to be condemned seeing that we

[1] *On Tumours of the Bladder*, London, 1884, p. 17.

[2] *British Medical Journal*, 1890, vol. ii, p. 332.

have at our disposal the electric cystoscope and ureter catheters; but in order to employ these instruments the surgeon must educate himself in their use, just as in the use of any other instruments of precision. The cystoscope may be used both in men and women, and when properly employed the examination subjects the patient to very little risk—less, indeed, than the use of a sound. The sound is too frequently employed in cases of hæmaturia. It is only when the bleeding is the result of a vesical calculus, or an enlarged prostate, or an hypertrophy of the bladder that any reliable information can be gained by the employment of the sound: and when the hæmaturia is due to other lesions, much harm may be done by the rough manipulation necessary to examine the bladder with that instrument. The educated use of the cystoscope being more gentle is less dangerous, and it is more valuable; but it should always be used with strictly aseptic precautions. It must be remembered that, where the bladder or other portion of the urinary tract is the seat of disease, the risk of septic contamination is much greater than when these parts are normal: and, when septic contamination does occur, the gravity of the condition is proportionately greater. In all cases, not only should the cystoscope itself be thoroughly sterilised, but the meatus and surrounding parts should also be carefully washed and rendered as free from contaminating particles as possible: and after examination has been made, the bladder should be carefully washed out with a fresh supply of suitable antiseptic solution. Cases undoubtedly have been recorded where, especially in tuberculosis of the kidneys and bladder, dangerous pyelitis and cystitis have followed the use of instruments; but I feel convinced that such evil consequences could not have resulted if the precautions I have just indicated had been carefully attended

to. I first suggested the employment of the electric light for examination of the human bladder in 1883 by introducing an electric endoscope into the female bladder. At that time the instrument was simple, and for the female served its purpose well: but since then many improvements have been made, so that now for many years the male bladder also has been open to inspection by means of Leiter's instrument. By making careful examination with the cystoscope, it is usually easy to ascertain whether or not the blood is from the bladder: but in a few instances it is not safe to conclude from the fact of no lesion being observed in the bladder that the hæmaturia is therefore either renal or urethral in its origin. When, however, the blood is seen by the cystoscope flowing from the orifice of a ureter, or more rarely from both ureters, the observation is of the highest importance as indicating the source from which the blood comes. The following case illustrates this:—

Case XX.—*Hæmaturia—Pain in the Lumbar Region and Physical Signs of Left Movable Kidney—Torsion of the Renal Vein and the Ureter—Ragged Orifice of Left Ureter—Blood from Left Kidney only.*

The patient, a woman, was sent to me by Dr. Dunsmuir, of Renfrew, and in a letter he gave the following history:—"She came under my observation on 17th February last, when she complained of frequent micturition, blood in the urine, pain in the lumbar region, and something which she could not well describe in the left renal region. About twenty years ago, while in the act of lifting some heavy wet clothes out of the boiler in the washing-house, she felt as if something had broken in her abdomen, and ever after had an uncomfortable looseness which she partly remedied by sewing a pad to her stays. About eight years ago acute pain supervened in the

lumbar region, and up to the present had been constantly there: it varies with position, being aggravated in the erect posture, and minimised slightly by inclining forward. About seven weeks ago frequent micturition came on, and a few weeks later she took to bed, and on passing urine her attention was arrested by its fearfully foul smell. On examining it she observed it to be perfectly black, and was for the first time alarmed about her health. Since that time the urine has never been free from blood, but varies with her movements: smoky with deposit of mucus and blood-cells after a period of absolute rest, inky black after the jolting in a cab, and claret-coloured after each bimanual examination of the left kidney. Only one clot has been detected, which was of the length and breadth of the little finger-nail and one-eighth of an inch thick, with a little tail attached. The abdominal wall is very lax, allowing a fairly easy bimanual examination, which elicited a tumour, partly in the left hypochondrium, partly in the epigastric and umbilical regions, of a firm consistence and kidney shaped." I examined the patient, and found the left kidney mobile and considerably enlarged, and on examination of the urine the deposit presented peculiarities which were difficult to explain, a red deposit was rapidly thrown down, and on microscopic examination it presented the appearance of shreds of fibrous tissue with minute fatty globules entangled in it: along with this numerous blood corpuscles were seen. The deposit was so different from anything that I had previously seen that I submitted it to others for examination, and the consensus of opinion was that these shreds were probably the *débris* from a renal or vesical tumour. Examination of the bladder with the cystoscope showed it to be practically normal, the only morbid condition was the appearance of the orifice of the left ureter, which was ragged and elevated and presented very much the appearance

of the crater of a volcano. While observing the appearance of the ureter, blood-stained material was seen to escape from it: this examination led me to suspect the presence of a tumour in the kidney, but the history of the case as given by Dr. Dunsmuir rather favoured movable kidney leading to torsion of the renal vessels. With the assistance of Dr. D. M'K. Dewar, I exposed the kidney and found it to be healthy, but very free and movable: a large portion of the adipose capsule was removed, and the kidney sutured to the parietes. Since the operation there has been no hæmaturia. During one of the attacks of hæmaturia, while the patient was in the "home," the blood suddenly disappeared and recurred five hours after, apparently more profusely than before. The clearing up of the urine was coincident with increase in the pain and swelling in the renal region, and the reappearance of blood gave relief to the pain and swelling, and a cast of the ureter was found in the urine.

Catheterisation of the Ureters.

This method of examination is not so necessary in cases of hæmaturia, nor is it so reliable as in those of pyuria: not necessary, because generally if the hæmaturia is purely renal the escape of blood from the ureter can be readily seen by means of the cystoscope, and not reliable because the use of the catheter may cause hæmorrhage. To perform such a delicate operation by the sensation of touch alone is very difficult, and it is only by patient and prolonged practice on dead subjects that one can hope to succeed in performing the operation on the living, but once the art has been mastered it is easier to pass a catheter into the living ureter than into the dead one.

Catheterisation of the ureter in the female has been much

simplified by Kelly, of Baltimore.[1] The essential feature of his method is that of the introduction of a straight speculum into the empty bladder. The walls of the viscus are slightly separated by the position assumed by the patient, the dilatation being such as to bring the orifices of the ureters into view when reflected light is thrown into the bladder by a forehead mirror. I have repeatedly used this method and found it simple and satisfactory, and easier of application than the method I first employed, which required very considerable practice and dexterity. Those who desire to catheterise the ureters must carefully study their direction in the various parts of their course, and must always remember that gentle manipulation is of the highest importance. I have frequently succeeded in carrying out catheterisation of the male ureters by the special catheters devised for the purpose without the aid of any light.[2]

Within the last few years two catheterising cystoscopes have been introduced, the one by Nitze, and the other by Casper. The former instrument I have not had an opportunity of using, but the latter I have employed in a number of cases and find it a considerable improvement upon my own method, and I have no doubt other surgeons also will find it a very valuable instrument when they have become accustomed to manipulate it. Some surgeons, however, who do not take the trouble to gain the necessary dexterity in the use of such instruments, are apt to condemn them or to entrust them to experts only, but the use of the cystoscope and the catheterising cystoscope will, I have not the least doubt, become more general, just as the ophthalmoscope, laryngoscope, and rhinoscope have ultimately asserted their position as aids in diagnosis. In catheterising the ureters it must be borne in

[1] *Twentieth Century Practice of Medicine*, 1895, vol. i, p. 675.

[2] Newman, *Surgical Diseases of the Kidney*, 1888, p. 415.

mind that rough introduction of the catheter may of itself lead to hæmorrhage, and certainly this is a drawback to its use, especiallly when the catheterised ureter is the seat of inflammation. In the female the procedure is easily carried out, and the results are tolerably certain, but in the male, even when one succeeds in introdueing the catheter into the ureter, it is difficult to say to what degree the results obtained are to be relied upon.

A point of considerable importance in diagnosis is the appearance of the orifice of the ureter as seen by the cystoscope. This question I cannot discuss in detail at present, but it may be stated as a general observation that when there is distinct evidence of irritation at the orifice of one ureter while the other is normal in appearance, it may be safely inferred that the lesion produeing the hæmaturia is on the side of the morbid ureter.

III.—By estimating the Quantity of Hæmoglobin and comparing it with the Amount of Albumen in the Urine.

Urine containing blood is always albuminous, but the relative proportion existing between the red corpuscles and the serum depends upon whether or not the hæmorrhage is associated with inflammation. For example, in acute nephritis the general inflammatory hyperæmia causes large quantities of albumen to pass into the urine independently of the hæmorrhage. The relationship between the quantity of hæmoglobin and the amount of albumen in the urine will therefore aid one in determining the seat of the hæmorrhage. In 1880 I showed at a meeting of the Glasgow Pathological and Clinical Society an apparatus for estimating by a simple method the quantity of hæmoglobin in solution. The quantity

of hæmoglobin having been estimated and the amount of albumen determined by one or other of the recognised processes, the two results should be compared. If the ratio of albumen to hæmoglobin is 1 to 1·6, then it may be concluded that the appearance of albumen is entirely due to the presence of blood; but if the quantity of albumen is much increased beyond the proportion just mentioned, the indication is in favour not only of an independent albuminuria, but also of a renal affection as the cause of the hæmaturia.

IV.—By carefully considering all the other Objective and Subjective Phenomena.

The questions which have been considered up to the present give but a rough sketch, the detail requires to be carefully filled in before the picture is completed. In order to do this the practitioner must consider the most common sources of hæmaturia, and enumerate the various lesions of the kidney, the ureters, the bladder, the prostate, the urethra, and the testicles which may give rise to the symptom under discussion. It is well always to conform to this rule in going over the etiological factors which have been indicated above.

Before illustrating or discussing in detail these individual lesions it may be well to make some general remarks as to the characters of the urine in renal hæmaturia, and it may be here stated that the cases are brought forward only to illustrate the etiology and symptomatology of hæmaturia, the question of treatment not being discussed in this chapter. Placing aside for the present the hæmaturia due to hydatid disease, the renal hæmorrhages of the greatest practical importance, from our present standpoint, are those arising from injury, renal calculus, tumours of the kidney, and tuberculous disease of that organ. Having

determined that the hæmorrhage is not from the lower urinary tract, it remains to ascertain which of those four causes is to blame.

When the hæmorrhage is due to renal calculus it is usually small in amount, sometimes constantly present, but generally with more or less prolonged intervals, and commonly oft-repeated. In some instances, however, the hæmaturia is very slight, while in other cases it may be the only symptom. The bleeding is not closely related to pain or to the development of other symptoms, but as a rule it is increased by movements of the body. This, however, does not follow immediately, but a short interval may elapse—hours, or even days—between the exertion and the appearance of the blood in the urine. While the hæmaturia of renal calculus is more copious after exercise, rest in bed usually appreciably diminishes it. This peculiarity is most characteristic. The blood, it must be borne in mind, is derived from the renal pelvis and not from the parenchyma: consequently renal blood-casts are not found in the urine, and the quantity of albumen is fully explained by the presence of blood. When the urine is evacuated the blood is thoroughly mixed with it, but not so intimately as when the cause of the hæmaturia is structural disease of the kidney, and if the urine be allowed to stand for a few hours the blood corpuscles are readily precipitated, and leave the supernatant urine clear. If free from blood the urine will also be found to be non-albuminous. The presence or absence of pus in the urine will be determined by the circumstance whether or not the calculus has induced inflammatory changes, and the existence of a swelling in the renal region will depend upon the amount of freedom for the escape of urine by the ureter. Renal hæmorrhage from tumour is generally more profuse and less transient than from calculus, and in not a few cases it is so copious as to cause marked anæmia—a result seldom induced

by calculous hæmaturia. It is often developed without any preceding pain. In calculous disease injury or exercise commonly provokes the bleeding, and therefore one finds the hæmorrhage more profuse during the day while the patient is moving about. The bleeding from tumours is, on the contrary, most likely to occur during the night, while the patient is at rest in the recumbent posture. The urinary deposit may assist one in the diagnosis. Concretions composed of oxalate of lime, uric acid, phosphates, or urates, may indicate the character of the stone, while by carefully filtering the urine in cases of tumour portions of the growth may be procured for microscopic examination. The presence of a persistent swelling in the renal region, associated with considerable hæmaturia, is of significance, and may be held as clearly indicating the presence of a neoplasm in the kidney. Exceptions to this rule have, however, been recorded by Ebstein, Hirtz, and Fleming. But while this is so, it must not be forgotten that the presence of a palpable new formation may for a considerable time be preceded by the presence of blood in the urine. Considerable distention of the pelvis may be produced by a calculus obstructing the ureter, and so lead to a swelling in the renal region, or the bulging in the loin may be caused by enlargement of the kidney from tuberculous disease: in neither of those conditions, however, does hæmaturia frequently occur. In the latter the very obstruction which causes an increase in bulk of the kidney prevents the hæmorrhage.

Although much difficulty is often experienced in distinguishing calculous hæmaturia from that caused by tumours, there is still greater care required in the diagnosis between the hæmorrhage of early tuberculous disease and that of renal calculus. The symptoms of the two latter conditions are sometimes identical. This is especially so when the patient

fails to show any other evidence of tuberculous disease than that revealed by the renal lesion. In tuberculous disease hæmaturia is frequently absent for long intervals, is seldom so severe as in stone, and is not increased by exercise. In both conditions pus may be mixed with the urine, but while in the latter concretions and gravel may be discovered, in the former careful and repeated search may demonstrate the presence of tuberculous bacilli. In the early stage of tuberculous disease of the kidney the quantity of albumen in the urine is generally in excess of that accounted for by the blood, and in the later stages, when pus appears in considerable quantity, the pus and blood are not so rapidly or so completely precipitated from the urine as in calculous pyelitis. The presence of phthisis pulmonalis, tuberculous disease of bones or joints, of the testicle, the prostate, the vesiculæ seminales, the mesenteric glands, the intestine, or of the lower urinary tract, may give a clue to the cause of the hæmaturia. I will now endeavour to describe more in detail, and illustrate by cases, the various lesions of the kidney which are associated with more or less profuse and persistent hæmaturia.

Chapter V.

TRAUMATIC LESIONS CAUSING HÆMATURIA (a) FROM INJURY, (b) FROM CALCULUS, WITH CASES.

(*a*) From Injury.

In hæmaturia consequent upon injury of the kidney the urine is generally scanty and highly coloured with blood, and long thin coagula, casts of the ureters, may be observed. The presence of blood in the urine in such cases does not necessarily denote rupture or laceration of the organ: and, on the other hand, severe injury may be sustained by the kidney without blood at any time appearing in the urine. The latter contingency may arise either as a result of plugging of the ureter by a clot, or as a consequence of rupture of the ureter from the violence which caused the injury to the kidney, or in rare instances it may be due to the rupture of the kidney being so extensive that the blood escapes into the perinephric tissue only, and not through the ureter to the bladder.

Case XXI.—*Transverse Rupture of the Right Kidney with a great Effusion of Blood behind the Peritoneum and into its cavity—Death from Peritonitis on the Fifth Day.*[1]

The patient, a man whom I saw in private, fell from a height of 36 feet, alighting first upon his right foot and thence

[1] Glasgow Royal Infirmary Museum, Series vii, No. 14.

on the buttock: he dislocated his right hip-joint and ruptured the kidney on the same side. The patient was seen within a few hours of the accident, and then to the naked eye there was no appearance of blood in the urine, but within six hours a long, narrow clot, probably a cast of the ureter, was evacuated along with a quantity of deeply blood-stained urine. On the following day there was a distinct fulness in the flank corresponding to the position of the right kidney and the hæmaturia continued, but no more blood-clot was observed. The patient complained of a dull, aching pain in the renal region: this was increased greatly by deep inspiration or movement of the body, and on palpation there was great tenderness. The patient died from peritonitis on the fifth day, and at the *post-mortem* inspection a considerable quantity of blood was found effused behind the peritoneum and into its cavity, and the cortex of the kidney was ruptured transversely in many places, but not to any great depth.

In some individuals very slight concussion may cause hæmaturia independently of the existence of renal calculus, and in those instances recovery usually takes place within a short time. Sprains of the lumbar region may cause the appearance of blood in the urine. The hæmorrhage in such cases is easily explained. When the spine is acutely bent upon itself, as it was in the case just mentioned, the kidneys, being firmly bound to the column, are made to describe a contortion similar to that of the spine, as a consequence of which not only may the convex aspect of the organ be lacerated and torn transversely, but the sudden jerk may force the kidney away from the middle line and tear the pelvis or the ureter. The blood may therefore escape in two ways—into the tissues surrounding the kidney, where, if the

patient survives, it may give rise to perinephric inflammation and abscess, or by passing down the ureter it may give evidence of the injury the kidneys have sustained. But while laceration of the kidney may occur without a bruise in the loin, in the majority of instances a blow upon the lumbar region is the direct cause.

There is not much difficulty in diagnosing this form of hæmaturia. The history of a lumbar sprain or of a blow or crush on the loin, indicated perhaps by ecchymosis, leads one to suspect rupture or contusion of the kidney. Severe damage to the kidney may, however, exist independently of any injury to the other abdominal organs and may of itself prove rapidly fatal: but in the great majority of cases there is evidence of violence elsewhere, and there are symptoms of rupture of other internal organs, especially of the spleen and liver. Generally, there will be marked and rapid collapse, pain in the course of the ureters as well as in the lumbar region, retraction of the testicle, difficulty in micturition, or even anuria. The following case is an instructive one, and may be quoted as showing how the surgeon might be led astray—it is detailed in *Surgical Diseases of the Kidney*.[1]

Case XXII.—*History of a Fall Followed by Ecchymosis in the Left Lumbar Region—Hæmaturia, Suspected at first to be due to Laceration of the Kidney but Latterly Demonstrated to be from a Papilloma in the Bladder.*

"Three years ago an instructive case came under my notice in private practice. A boy, aged 15 years, fell a distance of 12 feet and alighted on his side, which struck violently against the edge of a packing-box. When I saw him he was unconscious, and the only facts I could arrive at were the history of a fall, the circumstance that there was

[1] Newman, *Surgical Diseases of the Kidney*, p. 312.

ecchymosis over the right eye and in the left lumbar region, halfway between the lowest rib and the crest of the ilium, and the presence of blood in the urine. The lad remained unconscious for two hours, but with the exception of severe pain in the head for a few days he had no bad symptoms. The hæmaturia continued, however, and on more minute inquiry I found that the urine had previously to the accident 'been red when passed,' and when the patient had recovered from the injury due to the fall I discovered for the first time that he had a small papilloma in his bladder from which blood continued to flow at irregular intervals. In this case, from my inability to obtain information respecting his past history, I at first believed the hæmorrhage to be from the kidney, which I thought had been injured by the fall, but subsequent investigation showed that in this assumption I was entirely wrong. It will therefore be seen that while hæmaturia is one of the most reliable symptoms of contusion or laceration of the kidney from traumatic causes, cases of injury in the lumbar region may co-exist with hæmorrhage without these circumstances being related to one another as cause and effect."

In cases where the kidney is bruised, with or without laceration of its tissues, hæmaturia may be present for a few days after the accident, but in rare instances it may be prolonged for weeks, as illustrated by a case recently admitted into my male ward. The bleeding is not usually prolonged or severe and the appearance of blood in the urine may not closely follow upon the injury: its appearance, indeed, in some cases may be delayed for hours, or even for days, through a blocking of the ureter by a coagulum. The following case illustrates this:—

Case XXIII.—*History of a Fall with Bruising—Severe Pain and Swelling in the Left Lumbar Region, followed three days afterwards by a Copious Hæmaturia, coincident with Relief of Pain and Disappearance of Swelling in the Loin.*

A man, aged 64 years, was admitted to the Glasgow Royal Infirmary on 1st April, 1896, and he stated that a fortnight previous to admission he had fallen a distance of 30 feet, and landed, he thought, on his buttock, but on recovering from the immediate shock of the injury he suffered from a severe lacerating pain in the left lumbar region. The following morning he had so far recovered that he resumed his work, even although the pain in the region of the kidney was very severe. In the evening of the second day after the accident he found the left side much swollen and the pain had considerably increased, but on the third day the pain was greatly relieved and at the same time the urine became for the first time deeply stained with blood and he observed a number of small blood-clots in the urine. The hæmaturia continued for over a week, when he sought admission to the hospital. Previous to the accident he had never noticed any blood in the urine. When he was admitted the bladder was found to be filled with blood-clot, so that a catheter required to be passed and the bladder washed out. The bleeding continued until 10th April, when it suddenly ceased without any recurrence of the swelling or pain in the left lumbar region.

In the more severe lacerations of the kidney the urine is usually highly coloured and scanty, and blood appears in the first quantity of urine passed after the accident. The hæmaturia may not be constantly present, and may vary in amount from time to time, or it may not appear at any time in the whole course of the case; consequently its absence must not

be taken as an indication that the kidney is free from injury. Supposing the ureter to be completely torn across, or the kidney divided through nearly its whole thickness, the great probability is that the blood will escape into the tissues surrounding the injured organ rather than by the ureter and bladder.

CASE XXIV.—*History of Fall of over 60 feet producing Large Scalp Wound, Punctured Wound between the Right Scapula and Spine, Compound Fracture of the Left Leg, and Rupture of the Liver and Kidney.*

The patient was admitted to the Glasgow Royal Infirmary on 20th March, 1896, suffering very severely from shock. About 11 P.M. on the previous evening he fell down the shaft of a mine, about 66 feet deep, into water about 3 or 4 feet in depth. On examination, the patient was found to have sustained a long scalp wound on the back of his head, a punctured and lacerated wound between the right scapula and the spine, a wound over the right elbow, and a compound fracture of the left leg 3 inches below the knee, which exposed the bone for 3 or 4 inches. Although suffering severely from shock at the time of admission, he gradually improved during the following day, but complained very much of pain in the small of the back. Thirty ounces of urine were passed on the 21st, and it contained only a small quantity of blood. On the morning of the 22nd he suddenly became much weaker, the pulse failed rapidly, his respirations became more laboured, and death occurred about 1 P.M.

The *post-mortem* examination showed, beyond the external injuries above mentioned, a slight rupture on the convex upper surface of the liver, some sub-serous ecchymosis at the cardiac end of the stomach, and the adipose capsules

of both kidneys filled with blood which had escaped through large ruptures of the renal tissues; no blood had escaped into the peritoneal cavity. On the other hand, hæmaturia may be a prominent symptom after an accident without the kidneys themselves being injured in any way. I well remember a case which came under my notice many years ago while I was resident assistant in the Western Infirmary, Glasgow.

CASE XXV.—*Injury to the Pelvis and Right Lumbar Region—Severe Hæmaturia, thought at first to be Renal, afterwards proved to be from the Neck of the Bladder.*

The patient, a lad, aged 15 years, by occupation a carter, was leading his horse and a heavily-laden cart up a steep hill. Walking backwards in front of the horse, he suddenly slipped, and one wheel of the cart passed obliquely over his pelvis and right lumbar region without causing any fracture of bone. When brought into the Western Infirmary he complained of great pain in passing urine, which was highly stained with blood. For some time the hæmaturia was believed by the late Dr. J. G. Lyon to be due to a rupture of the kidney, but on more careful examination it became abundantly evident that the escape of blood arose from an injury of the urethra close to the neck of the bladder, which led finally to the formation of a urethro-rectal fistula.

CASE XXVI.—*Fall producing Severe Injury in the Right Lumbar Region, followed by Renal Pain and Hæmaturia lasting for Three Days—Apparent Recovery in One Month, followed by Return of Pain, Sense of Weight in the Right Lumbar Region, and Physical Signs of Movable Kidney.*

A man, aged 27 years, a fireman, was admitted into the Glasgow Royal Infirmary on 19th November, 1897. He

stated that in the previous July he fell from a ladder and struck his right side just below the ribs: the height of the fall was only about 3 feet, and at the time the injury appeared so trifling that he continued his work for three hours thereafter: but on walking home from his work he began to suffer from severe pain just below the right ribs in the lumbar region. It was aching in character, and increased by deep inspiration, coughing, or bending forward the body. The first quantity of urine passed contained blood, but no blood-clots were observed. The hæmaturia continued for three days only, after which the urine became quite clear. After remaining ten days in bed the pain became less severe, but occasionally while at work it recurred, and did not finally disappear until about a month after the injury. Five months after the accident, while lifting a heavy weight, he felt as if something had given way in his back, and shortly the pain became so bad that he was forced to give up his work and take to bed. The pain on admission to the hospital was very severe, and occasionally passed down the right thigh as far as the knee. On examining the abdomen a distinct right movable kidney was discovered, even although over it the muscular resistance was increased. In the lumbar region on the right side the percussion was unduly dull, even when the patient was lying upon his face and the right kidney pressed forwards. The urine was strictly normal in all respects.

While these cases sufficiently illustrate the hæmaturia produced by direct injury, I have seen other cases where slight indirect violence has been followed by the appearance of blood in the urine for the first time. It is not to be concluded in such cases that the traumatism is the only cause of the hæmorrhage: pre-existing disease may not up

till the time have shown itself by a hæmaturia, but a hæmorrhage may be brought on by a slight direct or indirect blow, as, for example, there may be a stone in the kidney, or a tumour, or chronic Bright's disease. The patient receives a blow in the lumbar region, he falls on his buttock, or he sustains a sudden strain from lifting a heavy weight, then suddenly he has a sharp pain in the renal region or feels as if "something had given way," and the first urine he passes thereafter contains blood. Here the injury has been the immediate exciting cause only, but the circumstance that a hæmaturia has been brought on by so trivial an injury makes one very suspicious of the presence of a soft malignant tumour either in the kidney or in the bladder.

Case XXVII.—*Carcinoma of the Right Kidney—First Symptom: Profuse Hæmaturia after a slight Fall, followed by Great Pain in the Renal Region, and the Passage of Large Blood-clots—Subacute Tubular Nephritis.*

The patient, aged 61 years, was seen by me three months before his death in December, 1885. The history given by his family attendant (the late Dr. Robert Smart) was that he tripped going downstairs and fell, landing upon his left side and buttock. No renal pain was experienced at the time of accident, but two hours afterwards he passed urine containing a considerable quantity of blood, and early the next day severe pain was experienced in the right lumbar region. This was coincident with the passage of a large quantity of blood-clot and some blood. On the evening of the day after the accident the bladder was filled with blood-clot, so that a large catheter required to be passed and the bladder washed out with boric solution. There was no renal colic, but the patient experienced a diffuse and intense pain in the lumbar region, which was increased by deep pressure;

rest in bed and the administration of hazeline had no effect upon the bleeding. The bladder was washed out with a solution of boric acid twice daily. Morphia suppositories were given, and after eight days the pain somewhat subsided and the hæmaturia diminished. The temperature rose to 102° F. in the evening, and oscillated between that and 99·5° during the next fortnight, when a second profuse hæmaturia occurred, which greatly weakened the patient. The urine had a specific gravity of from 1011 to 1015, and an alkaline reaction; it contained more albumen than was represented by the blood present, and the deposit was composed of mucus, triple phosphates, blood, leucocytes, large epithelial cells, and granular and epithelial tube-casts. The question of an operation was considered, but in the circumstances it was not deemed advisable. The patient died three months after the onset of the first hæmaturia, and at the *post-mortem* examination a large fungating carcinoma was found occupying the pelvis of the right kidney. Both kidneys were soft and considerably enlarged, and the mucous membranes of the pelves were in a state of acute catarrh and contained some muco-purulent material, and on microscopic examination the tissue of the kidney presented the characteristic appearances of subacute tubular nephritis. In this case probably the necessary catheterism of the bladder facilitated the fatal termination, but we had only the choice between two evils.

(*b*) From Calculus.

I have already referred to some of the features which distinguish hæmaturia arising from renal calculus and that due to other causes, but still there are points which require attention. The most obvious characteristics of this form

of hæmaturia are that the bleeding is seldom profuse or obstinate. The blood is generally light in colour, and the hæmorrhage is, as a rule, brought on by sudden movements or active exercise, and it is associated generally with severe colicky pain. These circumstances when accompanying or determining the hæmaturia give the symptom its special value. In cases of renal calculus without suppuration, especially if the stone be impacted in the renal substance, the symptoms are not marked; indeed, the only indication of disease may be occasional slight renal pains, with or without hæmaturia, or severe pain may exist for a time and then disappear for a long period. It is in such cases that the diagnosis of renal calculus is difficult, sometimes quite impossible. There may be renal pain, frequent micturition, slight hæmaturia, or even the presence of small quantities of pus in the urine, from an undue increase in the free acid in that excretion or from oxaluria. The habitual deposit of uric acid or oxalate of lime in urines of high specific gravity is often associated with dyspeptic, nervous, and other symptoms strongly suggestive of renal calculus. These may last for long periods, but if suitable treatment be adopted they usually disappear. On the other hand, considerable, sometimes enormous, stones may be discovered in the kidney after death, although no renal disturbance had been known to exist at any period during the life of the patient. This is not uncommonly observed in hospital practice. Under such circumstances the want of knowledge may reasonably be attributed to the carelessness of the patient, but such an explanation cannot be urged for a case which Dickinson describes. A renal calculus, composed of phosphates of magnesia and ammonia, weighing $7\frac{1}{2}$ oz., was taken from the body of a daughter of Sir Richard Steele, in whom during life no symptoms

indicated its presence. In uncomplicated cases of renal calculus the pain is generally dull or may only amount to a sense of weight in the loins on the affected side. It is, as a rule, inconstant, absent while the patient is at rest but aggravated on any movement of the body, but especially by jolting movements, such as jumping, riding, driving, &c. The pain may also vary with posture, one attitude being generally associated with increased discomfort, while another may bring relief. The unpleasant sensations just referred to are for the most part limited to the affected side, they may, however, extend along the course of the ureter to the perineum, the testicle, or down the thigh; but while this is so the pain may pass over or even be limited to the opposite renal region. In non-suppurating cases of calculus, hæmaturia is one of the most important symptoms. But while, on the one hand, it may be true to state that of all causes of hæmorrhage from the kidney calculus is the most common; on the other hand, a calculus may occupy the kidney without at any time causing the patient to lose a perceptible quantity of blood. Although constantly present or oft repeated, hæmaturia from calculus is rarely so profuse as to cause marked anæmia. Perhaps the most characteristic feature of calculous hæmaturia, as distinguished from other forms, is its dependence upon movements of the body. Sometimes the appearance of blood or an increase in the hæmorrhage does not immediately follow exercise, but only shows itself after some hours or even days.

Case XXVIII.—*Renal Uric Acid Calculus—Exercise causing immediate Pain and Hæmaturia the following day—No Blood-clots in the Urine.*

The patient, a woman, aged 58 years, in 1888 consulted Professor (now Sir) William T. Gairdner, who sent her to

me. She had suffered from violent colicky pain in the right renal region for the previous six years. At first the attacks were slight, and were always brought on by some active exercise. They did not recur oftener than once in six or eight months, but latterly the recurrences of pain were more frequent, and were accompanied by hæmaturia; usually, however, the quantity of blood was small in amount and the urine cleared up very soon after the patient procured complete rest in bed. So long as she remained at rest the pain did not trouble her and the urine remained clear, but if she took active exercise it was certain to bring on an attack of pain, which was followed by hæmaturia in from eighteen to twenty-four hours. This delay in the appearance of blood was frequently observed. No blood-clots were seen in the urine at any time, and the urine passed at the onset of the attack, and for several hours following, was clear and of low specific gravity, from 1006 to 1008.

The circumstance that no blood-clots were seen in the urine seems to indicate that the non-appearance of blood in the urine till the day following the onset of pain was not due to obstruction of the ureter by coagulum. The most reasonable explanation of such cases seems to be that the irritation of the calculus in the pelvis or at the entrance of the ureter induced a reflex inhibition of the function of the affected kidney only, either by producing a spasm of the walls of the ureter or contraction of the small renal arteries, and that this spasm passing off was followed by an undue relaxation of the capillaries, a passive hyperæmia and transitory hæmorrhage following. Most usually, unilateral obstruction, such as is produced by the presence of a calculus in one ureter, causes reflex inhibition of both kidneys and complete anuria. Irrita-

tion of the urinary bladder, as manifested by frequent and sometimes painful micturition, is not an uncommon accompaniment of renal calculus—so much so that I have seen this disease mistaken for cystitis or suspected to be vesical calculus. This mistake is, however, more apt to occur when the renal stone has caused suppuration. On account of the intimate relationship which exists between the nerve-supply of the kidneys and that of the alimentary canal, hæmaturia and renal pain, especially if intense, are accompanied by more or less gastric disturbance, varying in degree from the mildest attacks of nausea to the most violent vomiting of bilious matter, flatulence, and gastrodynia. When the renal calculus has given rise to or is associated with suppuration, the symptoms are generally distressing and persistent. The amount of irritation in the kidney, in the renal pelvis, and in the ureters caused by a concretion depends largely upon its nature and situation. The rougher, heavier, and more freely movable a calculus is, the higher will be the degree of irritation, as manifested by symptoms of pyelitis or pyonephrosis superadded to those of calculus. On the other hand, the effect of prolonged rest in the treatment of renal calculus is well recognised. The following case is a good illustration of it.

Case XXIX.—*Constant Dull Pain of Four Years' Duration, Occasional Attacks of Hæmaturia from the Right Kidney, sometimes very Profuse after Exercise — Nephro-lithotomy advised but refused—The Symptoms Cured by Rest in Bed.*

A man, aged 35 years, consulted me at the Glasgow Royal Infirmary, and was admitted on 15th November, 1892. Two and a half years prior to admission the patient was playing lawn tennis, when he suddenly strained himself, and within a few hours he passed a large quantity of dark, mahogany-

coloured urine, but this was not accompanied by any pain. Six months after this he had a recurrence of the hæmaturia, associated with an acute attack of renal colic, which, however, only lasted for a short time, but after the first attack he had recurrences both of the hæmaturia and pain every five or six weeks. On admission, physical examination elicited no abnormal conditions beyond increased resistance in the right lumbar region. The urine was highly coloured, of specific gravity 1028, acid, containing a deposit of mucus and a slight trace of albumen, but no blood or pus. Four days after admission the patient had an acute attack of hæmaturia and of severe pain, which lasted from 6 A.M. till 9·30 A.M., when he was placed under chloroform and the bladder was explored with the cystoscope. The examination revealed blood issuing from the right ureter in small quantity, and the orifice of the ureter was occupied by a clot. The circumstances of the case seemed to warrant a diagnosis of renal calculus, and the patient was advised to have it removed by operation. This, however, he refused, and so complete rest in bed was ordered. The patient was kept at absolute rest for four weeks, and during that time he had no recurrence of the pain or of the hæmaturia. He remained in bed for other six weeks after leaving the infirmary, and on 21st March, 1897, he reported that he had had no recurrence of the pain or the bleeding since he left the hospital on 16th December, 1892.

Chapter VI.

HÆMATURIA FROM PASSIVE HYPERÆMIA, FROM INFLAMMATORY DISEASES, AND FROM TUBERCULAR LESIONS.

Passive Hyperæmia.

(*a*) *Pressure on the Renal Veins.*—There are many lesions which may lead, by pressure upon the renal veins, to a passive hyperæmia, which reveals itself during life by the presence of albumen or of blood in the urine. I have seen instances where large abdominal tumours or aneurysms have caused obstruction to the exit of blood from the kidneys and so produced a hæmaturia. Sometimes a similar condition is brought about by pressure of a greatly enlarged liver, by syphilitic new formations, or by malignant tumours in the neighbourhood of the spine. Such conditions require only to be mentioned here, as they seldom come under the treatment of the surgeon.

(*b*) *Torsion of the Renal Veins.*—I brought before the Clinical Society of London[1] two cases (Cases I and II) of movable kidney in which hæmaturia was a prominent symptom as a consequence of interference with the venous flow from torsion of the renal veins. When the kidney

[1] *Transactions of the Clinical Society of London*, vol. xxx, p. 65. See also Case XX.

was displaced in certain positions blood appeared in the urine, and when the displacement was rectified by operation the symptoms disappeared and the hæmaturia ceased.

(*c*) *Reflex Spasms of the Arterioles.*—This condition has been referred to above (see Cases VI and VII). The spasm is probably due to morbid motor impulses conveyed from the nerves proceeding from the solar plexus. Sudden relief of intra-abdominal pressure, as, for example, the removal of a large abdominal tumour or the evacuation of ascites fluid, may be followed by either an albuminuria or a hæmaturia, which seldom lasts, however, more than a few days.

Inflammatory Hyperæmia.

(*a*) *Nephritis, Acute and Chronic.*—In cases of acute nephritis, especially when the inflammation of the kidney is a sequela of typhoid fever, scarlet fever, pneumonia, or erysipelas, a considerable quantity of blood, and even blood-clots, may be found in the urine, which may be dirty rose-colour, dark-brown, or almost black. When the urine is very dark in colour it has been observed that the proportion between the colouring matter and the red blood corpuscles has been lost—that is to say, that the colouration of the urine is not fully accounted for by the corpuscles present. This anomaly is probably accounted for by the circumstance that the vessels of the kidney are under great inflammatory tension, and probably the inflammatory process is associated with rapid disintegration of the red blood corpuscles and solution of the hæmoglobin. This explanation is supported by the fact that when such urines are examined frequently at different times of the day a true hæmaturia may be at one time discovered, at another a true hæmo-

globinuria, while on a third occasion the conditions may be mixed.

Hæmaturia is not only observed during the acute stages of nephritis, but when the disease is chronic occasional outbursts of blood may be emitted during a period measured by hours or even days. These sudden appearances of blood are known in many instances to be traced to some exciting cause. For instance, in some cases of nephropathic anæmia it is only necessary to apply a simple vesicatory to cause the appearance of blood, in other cases cold is the determining cause, or a slight strain or fall on the buttock, or, again, in others the hæmaturia may be provoked by an intercurrent malady. Hence in all cases of hæmaturia arising in anæmic persons from slight causes the question of Bright's disease should be considered.

I have already referred to Mr. Harrison's paper on "Albuminuria associated with Kidney Tension" (see p. 17).

Mr. Harrison's cases were clearly instances of acute parenchymatous nephritis, and they raise the question how far in such maladies incision into the kidney may produce beneficial results. Parenchymatous nephritis is a disease characterised by scanty urine of high specific gravity which is very albuminous and contains blood, and on standing deposits blood-casts and casts of the uriniferous tubules which may be hyaline, epithelial, or granular, and associated with these renal symptoms other conditions are generally present, such as serous effusion, as shown by hydrothorax, ascites, and œdema, while at the same time symptoms of so-called uræmic poisoning may develop. *Post-mortem* the kidney is found to be enlarged and softened and the uriniferous tubules show very marked changes, such as swelling of the epithelium with a marked tendency to desquamation, so much so that the tubules may become

blocked. At the same time fatty degeneration of the epithelial cells is present and blood is very commonly present in the tubules. The blood probably escapes both from the mucous surface of the uriniferous tubules and from the glomeruli. During life, as I have observed, the extreme tension of the kidney is very marked. Considering that the expansion of the kidney is limited by a firm, fibrous capsule, any marked increase of tension in the parenchyma of the organ must seriously interfere with the circulation of the blood, and so impair the nutrition of the component elements of the organ and interfere with its function. This raises the question when an acute parenchymatous nephritis leads to suppression of urine and impending death of the patient. Is not the surgeon justified in stepping in and, by incision of the engorged organ, relieving the tension, which is probably impairing the circulation of blood and the performance of function? Because the kidney is an internal organ, and therefore not so easily reached as external parts, should it be treated otherwise than more superficial parts when presenting practically the same conditions?

In chronic tubular and parenchymatous nephritis, occasionally the urine is coloured of a rose-tint or even darker red, but in the intervals between the hæmaturiæ the urine shows evidence of renal disease by the presence of granular or hyaline tube-casts and small quantities of albumen, while the fluid itself is of a low specific gravity. The appearance of blood in chronic Bright's disease is well recognised, and a careful observer is not likely to overlook this form of hæmaturia or mistake it for any other, unless the renal disease happens to be complicated by the presence of other lesions. I met with a case four years ago where considerable difficulty was experienced in the early observations. The case was introduced as one of hæmaturia, which certainly

had been more profuse than is usually seen in cases of chronic Bright's disease, and was associated with painful and frequent micturition, so much so that the question of tumour of the bladder or vesical calculus was raised, but on cystoscopic examination the bladder was found to be typically healthy. The patient was kept at rest in bed and on milk diet, and within a few weeks the blood disappeared from the urine. The urine all along, however, contained traces of albumen, its specific gravity was seldom higher than 1008, and on standing a precipitate containing finely granular and hyaline tube-casts was detected by the microscope. Such cases require to be recognised by the surgeon, but strictly do not come within his domain.

(*b*) *Tuberculous Disease of the Kidney.*—In this malady the urine presents very marked variations at the different stages of the malady. In the early phases of the affection the presence of the virus induces a congested condition of the organ, and hæmorrhages occur which are analogous to the hæmoptyses in the initial stages of pulmonary tuberculosis (see Cases XXX and XXXI). When the kidney parenchyma and the calyces become more seriously involved, the characteristics of the urine are more distinct, but this is not always the case. The physical characters of the urine are in some instances such that one can with certainty state that the urinary tract is the seat of a tuberculous lesion, while in other cases the excretion may be to no appreciable extent altered from the normal. Before destructive processes commence within the renal pelvis or substance, traces of albumen and small quantities of blood may be detected, but when the tuberculous deposit has commenced to break down and evacuate into the ureter the quantity of albumen is increased, the urine is liable after a time to become alkaline, and, along

with greater or less quantities of *débris* of renal tissue pus appears in considerable quantity.

The albuminuria differs from that of Bright's disease in that the urine is not clear, but contains much mucus, is viscid, cloudy and opaque, and does not contain tube-casts. The deposit contains small caseous masses mixed with renal *débris;* and on standing, although a considerable amount of pus may be precipitated, a certain quantity remains suspended, and imparts a cloudy appearance to the fluid.

It is only in rare instances that profuse hæmaturia occurs in renal tuberculosis. Trautenroth[1] records the case of a woman, aged 24 years, who was the subject of pulmonary tuberculosis in its early stage, but who also suffered from profuse hæmorrhage from a tuberculous kidney which necessitated nephrectomy. The pelvis of the kidney was filled with coagulated blood, and upon one of the papilli a considerable ulcer was discovered. The parenchyma of the kidney was the seat of a diffuse tuberculosis. The urine before the operation was found to contain tubercle bacilli; the patient made a good recovery. Routier[2] records a somewhat similar case where the right kidney was the seat of a large tuberculous ulceration. Severe hæmorrhage occurred and continued during seventeen days, associated with renal colic: on making pressure over the right kidney blood was seen to escape from the right ureter by the cystoscope. The kidney was removed, and the patient made a good recovery. (See Cases XXX and XXXI.)

As the disease advances the odour of the urine, as a rule, becomes more and more offensive: the fluid deposits large quantities of mucus and triple phosphates, and on examina-

[1] *Centralblatt für Chirurgie*, 1896, No. 16.

[2] *Bulletin et Mémoire de la Société de Chirurgie de Paris*, vol. xxi, p. 148.

tion is found to be highly albuminous. Occasionally, while the urine is pale and of low specific gravity, there may be evidences of retention on the diseased side, as shown by increase in the renal swelling, with perhaps indistinct fluctuation and pain, accompanied by general constitutional disturbance: or there may be complete suppression, death being ushered in by uræmic symptoms.

In addition to the diagnostic points already indicated, the detection of the tubercle bacillus in the urinary *débris* is of great value. It is when tubercular lesions begin to break down that tubercle bacilli are most abundant, and sometimes their number is very large. Several examinations require to be made before one can conclude from negative results that the case is not tubercular. It is more difficult to obtain the bacilli from urine than from sputum; they are less numerous in proportion to the medium in which they lie; decomposition destroys them more rapidly: and smegma bacilli are apt to be mistaken for them. The method which I have employed most successfully is as follows:—Allow a quantity of urine to stand in a conical glass in a cold place for not more than six hours, and from the deposit select a small quantity of *débris;* place it in a glass of $\frac{3}{4}$ per cent salt solution. It is more rapid and reliable, however, to obtain separation of bacilli by the centrifuge. This method should always be resorted to when the numbers are small, or when the urine contains much mucus or blood. When large quantities of mucus are present, it may be necessary to render the urine slightly alkaline before using the centrifuge. Having placed a small fragment of the *débris* on a clean cover-glass, it should be spread out into a thin layer by pressing another cover-glass against it between the finger and thumb. On separating the cover-glasses a thin film of *débris* will be found adhering to each. The glasses

must be air-dried, and then the films may be more firmly fixed by drying over a spirit-lamp or in front of the fire. The cover-glasses are then placed in, or, still better, floated upon (with film side downwards) a solution of aniline magenta or a staining fluid of gentian-violet. When the film has become sufficiently stained, the colour may be abstracted from all structures other than the tubercle bacilli by passing the cover-glass through a 25 per cent solution of nitric acid. The action of the acid may be arrested by carefully washing the specimen in pure water. When examining the urinary *débris* for tubercle bacilli, it is necessary in most cases to prepare at least half a dozen specimens. Should bacilli be present, they will be recognised by a magnifying power of 750 diameters as minute rod-shaped bodies, coloured according to the nature of the staining-fluid employed. They are from 3 to 7 micro-millimetres long, may be straight, but are more frequently curved or bent upon themselves at an obtuse angle: are frequently beaded, and occur in bundles or singly. From the urine the micro-organisms are not easily cultivated, as putrefactive bacteria contaminate the culture and destroy the specific bacilli. Koch, however, states that he has succeeded in cultivating tubercle bacilli from cases of tuberculous pyelitis.

In some instances the bacilli in the urine are so few in number that it is difficult, or almost impossible, to discover them simply by the microscope; in such instances inoculation experiments may help to clear up the diagnosis. Tuberculosis can be communicated artificially to animals in many different ways, in fact, through any of the channels of access to the body—by inhalation, by feeding animals on tubercular products; injection into the serous cavities, beneath the skin, into the anterior chamber of the eye, or into veins. When tuberculous urine is injected subcutaneously into guinea-pigs

it produces a typical tuberculosis within ten or twelve days. The local swelling may break down, caseate, and ulcerate, while the lymphatic glands related to the part become enlarged and firm, and after a time may also caseate, and the disease passes on to another group. When injected into the peritoneal cavity the urine produces an extensive tubercular infiltration of the omentum and acute tubercular peritonitis. Normal urine, when aseptic, becomes absorbed without producing any evil effect, or when septic it induces a suppurative peritonitis. If, however, the experiment is performed with care, a negative result is obtained from healthy urine: but if the urine contains tubercle bacilli or their spores, acute miliary tuberculosis is developed in the course of a few weeks when the injection is made into the peritoneum, or, if the urine is placed underneath the skin, a hard tuberculous nodule is formed.

Besides the detection of the tubercle bacillus, it is necessary to determine whether the disease is on one or both sides. I have several times had occasion to examine by ureteral catheterisation cases of tuberculous pyelitis in which it was considered of importance to determine the extent to which the disease had involved one or both kidneys. Catheterisation can only determine the organ to which the tuberculous disease is limited: it cannot indicate the extent of the tuberculous lesion in the affected organ. But to make sure that one kidney was free from disease was at the time I first employed catheterisation considered to be a point of importance. The first time I succeeded in doing this was in 1886, when I examined a case and clearly showed that the tuberculous lesion was limited to one kidney:—A woman, aged 26 years, who was admitted into the Glasgow Royal Infirmary suffering from symptoms of tuberculous pyelitis of the left kidney, was first under the care of my colleague, Dr. Alexander

Robertson, who asked me to make the examination. Subsequently the patient was transferred to the surgical ward, under the care of Dr. Robertson's corresponding surgeon, Mr. H. E. Clark, who successfully operated by lumbar nephrectomy. Previously to making the examination by the ureteral catheters, it was noted that the urine was decidedly below the normal in quantity, that it had a specific gravity of from 1015 to 1020, and that it contained albumen and pus, the former in larger quantity than could be accounted for by the amount of the latter. The examination of the urine separately from the two kidneys gave the following results:—

TABLE SHOWING THE CHARACTERS OF THE URINE FROM EACH KIDNEY.

	Right Kidney.	Left Kidney.
Appearance, . .	Clear and pale in colour; on standing for six hours only a deposit of mucus and a few epithelial cells.	Dark straw colour; clouds on standing for six hours, with an abundant deposit.
Reaction, . . .	Neutral.	Alkaline.
Albumen, . . .	Very slight trace.	1·805 per cent.
Hæmoglobin, . .	None.	1 in 8,000.
Tube-casts, . .	None.	None.
Microscopic Examination, . . .	Slight deposit of epithelium and mucus; no blood, pus, or tube-casts.	Abundant deposit of pus, with triple phosphates; a few blood corpuscles and spheroidal epithelium; no tube-casts.

No tubercle bacilli could be discovered in the deposit from the urine, but after the kidney was removed it was found to be characteristically tuberculous. The patient made a good recovery.

Hæmaturia may be observed in tuberculosis of the kidney antecedent to the appearance of other signs or symptoms.

Case XXX.—*Profuse Hæmaturia with Slight Pain in the Left Kidney recurring thrice—No other Deposit in the Urine, and no Swelling in the Lumbar Region—Apparent Recovery for Two Years, followed by a Relapse of the Symptoms and a Swelling in the Left Lumbar Region—Muco-purulent Deposit in the Urine and Tubercle Bacilli—No Vesical Irritation.*

A young woman, aged 18 years, consulted me in September, 1893, on account of a profuse hæmaturia which had occurred a fortnight previously. No reason could be assigned for the onset of the bleeding, and it was unaccompanied by any pain over and above a sense of fulness and weight in the left renal region. A careful examination of the urine failed to reveal any abnormal constituents beyond a small trace of blood: but the hæmaturia had practically disappeared at the time I saw the patient. Three months after this first hæmorrhage a second attack, not so profuse or so prolonged as the first, occurred, and two months thereafter a third attack, all without any concomitant symptoms. On account of the difficulty in forming a diagnosis, an examination of the bladder was made during the last attack, and blood was seen issuing from the left ureter in a distinct cloud: it was therefore evident that the hæmorrhage was of renal origin: but as there were no symptoms pointing to the nature of the malady, complete rest in bed was enjoined, and the patient made what was regarded at the time as a complete recovery. Two years after the first hæmorrhage a fourth hæmorrhage occurred: this was associated with considerable pain in the left lumbar region, and a distinct swelling could be made out by palpation. Examination of the urine two weeks after the hæmorrhage occurred showed it to contain a deposit of muco-purulent material as well as blood corpuscles, and on microscopic examination tubercle bacilli were discovered. Still there were no symptoms present indicating

any irritation of the bladder. The temperature was now elevated for the first time, and the patient suffered from night-sweats; but there was no emaciation, loss of appetite, or serious constitutional disturbance.

This case illustrates to some extent the analogy between tuberculous lesions in the kidney and those in the lungs. It is by no means an uncommon occurrence to meet with cases of profuse and frequent hæmoptyses long prior to the development of physical signs of tuberculous phthisis: so also in renal tuberculosis hæmaturia may be present as a premonitory symptom of tuberculous disease long antecedent to the development of a gross renal lesion.

Case XXXI.—*Hæmaturia Thirteen Years previous to Admission, and again Nine Years after the First Bleeding—Large Tuberculous Pyonephrosis.*

A man, aged 39 years, was admitted to the Glasgow Royal Infirmary on 28th April, 1896, complaining of pain in the region of the right kidney. The patient's first trouble in connection with the urine dated back to thirteen years before, when he had a slight attack of hæmaturia accompanied by pain over the right kidney; but these symptoms passed off in a few days. The patient had been in the infirmary in February, 1896, with hæmaturia. He first noticed blood regularly present in his urine in November, 1895. He, however, was able to continue at work until the end of January, when he came into the hospital; at that time the hæmaturia was very considerable. He said that it was only three weeks previous to admission that he noticed anything like severe pain in the right side, and since the pain came on he had not noticed any blood in the urine. On examination, a very distinct fulness was found in the

right lumbar region. The whole space between the liver and the crest of the ilium was dull on percussion, and on pressure considerable tenderness was produced. The thoracic organs and the other abdominal organs were normal, so also was the bladder. The urine contained a considerable quantity of pus, and some blood and tubercle bacilli were present. The left kidney was healthy. On operation a large tuberculous kidney was discovered on the right side: it was scraped and evacuated.

In this case it is difficult to say whether or not the first hæmaturia thirteen years previous to admission was due to a tuberculous lesion, but the circumstances that nothing else was discovered to cause bleeding, and that no hæmorrhage has occurred since the operation, rather support the idea that it was a true case of tuberculous hæmorrhage from the beginning, but, just as may be noticed in pulmonary phthisis, the tubercular lesion became quiescent for a long period. Such cases as the two just recorded are uncommon, and are worthy of consideration.

Chapter VII.

HÆMATURIA IN CYSTIC DEGENERATION AND HYDATIDS,[1] *AND IN TUMOURS OF THE KIDNEY.*

Tumours of the Kidney.

Hæmaturia is the most important and significant symptom of malignant disease, especially cancer of the kidney, and tumours of the kidney are nearly always malignant. It is true various forms of fibromata have been recorded, and occasionally an osteoma, a lipoma, an adeoma, and cases of a papilloma have been published from time to time, but they are very rare. In tumours of the kidney hæmaturia takes place in about 25 per cent of cases in children; these are always, or almost always, sarcomata. In adults, about 20 per cent of the cases of malignant disease present hæmaturia as a prominent symptom; these are divided between the sarcomata and the carcinomata. In carcinomata alone 75 per cent of the cases present hæmaturia as a prominent symptom. Hæmaturia of malignant disease is rarely severe at its early stage, although cases have been recorded in which profuse bleeding occurred. As a rule, however, it is only as the disease advances that the loss of blood attains to such an amount as to form a distinct deposit. When the hæmorrhage has commenced it is more profuse, is steadily progressive, and less transient than when due to other causes,

[1] Cystic degeneration and hydatids have been already fully discussed (see Chapter III, p. 40, Cases XII to XIX).

and is generally spontaneous and continuous, although at intervals liable to aggravation. Clots frequently form, and may cause obstruction to the escape of urine through the ureter, bladder, or urethra (Case XXVII). The presence of organised constituents in the urine, such as epithelium, tube-casts, &c., is of comparatively little diagnostic value, although by some observers considerable importance has been attached to the presence of so-called "cancer cells." As a matter of fact, however, cells resembling those of a cancerous growth seldom find their way from the kidney to the bladder: in this opinion I entirely agree with Dickinson, who says, "I have met with not a few in which a discharge of cells of epithelial type, together with blood, has been supposed to indicate cancer of the kidney, but not with one in which this supposition has been verified. If I am told that such a one is passing 'cancer cells' in the urine, I conclude that, whatever his disease may be, it is not cancer of the kidney. A deposit consisting of blood-corpuscles, mixed, if with anything, with indefinite sanguinolent material, and that constant, during repose as well as under exercise, is a sign in this respect of more meaning. It is to be borne in mind that a fungating tumour of the kidney is less often cancer than sarcoma, the cells of which, associated as they are with connective tissue, are not to be easily and abundantly shed, while even should they reach the urine they are, at least in the small-celled varieties which are the more numerous, too small to attract attention when confused with red and white blood corpuscles."

In desquamative catarrh of a mucous surface the epithelial cells are shed in large numbers, and mingle with the secretion. From what has been written by some observers one would be led to the conclusion that they believed that this process of separation was all that happened to the epithelial cells,

and that these were thrown off from the mucous surface in much the same form as they presented during health. This is not so. When a mucous membrane is inflamed the epithelium becomes granular and undergoes a process of softening, so that the cells are capable of taking on the most varied forms and of throwing out prolongations. This is most marked when the superficial cells are rapidly thrown off and being replaced quickly by means of regenerative multiplication of the deeper cells. Hence the catarrhal secretion may contain epithelium in all stages of development, from round cells resembling pus corpuscles to caudate cells similar in appearance to those described as being characteristic of exudation from the renal pelvis. I do not deny that, for example, in vesical catarrh groups of tessellated epithelial cells of circular form are sometimes significant, and that in pyelitis, flattened, laminated, caudate epithelial cells may be often more abundantly present in the urine than when the renal pelvis is not involved in the inflammation, but the point I desire to impress is that the diagnostic significance of individual loose cells is of no more value than is the observation of single epithelial cells removed from a tumour. To diagnose pyelitis from the appearance of the cells in the urine is no more justifiable than the diagnosis of a cancer from a few isolated cells detached from a growth. If the mucous membrane was shed in small shreds or in casts, with the epithelium adhering, then the microscope might aid in the diagnosis: but when the histological relationships of the cells are lost, so also is their significance. The presence of loose epithelial cells does not indicate the nature of the renal affection, but if small portions of the neoplasm are discovered in the urine, their examination under the microscope will clear up the diagnosis.

In malignant disease of the kidney, when the tumour is limited to the substance of the organ, the urine is usually perfectly natural, but when the neoplasm has invaded the pelvis, blood-casts, epithelium, and portions of the growth may appear in the excretion. In the early stage of the disease, however, even before any abnormal constituent can be detected in the urine, the patient may experience considerable difficulty in micturition, probably the result of a reflex nervous excitement. In some cases of malignant disease the hæmaturia is a delayed symptom. This is especially so in cases of sarcomata. An enormous, soft, round-celled sarcoma may exist and develop without hæmaturia or any other disturbance in the secretion indicating the locality of the disease, as, for example, in the following case:—

Case XXXII.—*Large, Rapidly Growing, Round-celled Sarcoma of the Left Kidney, without any Abnormality in the Urine or Symptoms pointing to Renal Tumour—Physical Signs, however, characteristic.*

A child, aged 3 years, was admitted to the Glasgow Royal Infirmary on 2nd April, 1897. The patient was pale and emaciated, and the left side of the abdomen was occupied by a smooth, rounded swelling, highly elastic but non-fluctuant, in the lumbar region, and passing forward to within an inch and a half of the umbilicus. The swelling could be distinctly felt extending between the margin of the ribs and the bones of the pelvis, and over the entire area of increased resistance a dull note was elicited on percussion. The swelling was firmly fixed, and the patient did not complain of pain or discomfort further than could be explained by the pressure of the new growth. The history of the case showed that the swelling was first noticed three months previously to admission, but at that time

it was extremely small in size, so that, as far as it is known, the tumour was of not more than two and a half months' or three months' growth. No abnormal constituents were found in the urine at any time, nor did the patient complain of any vesical irritation. Operation revealed the presence of a huge round-celled sarcoma, which was removed by abdominal nephrectomy.

I have seen two other cases of malignant disease of the kidney—one a spindle-celled sarcoma, the other a carcinoma where hæmaturia was noted to have been present during the whole course of the case.

Sometimes the diagnosis of malignant disease is rendered difficult by the presence of a calculus in the diseased kidney. The following case I brought before the Glasgow Pathological and Clinical Society in 1895:—

Case XXXIII.—*Renal Calculus with Symptoms of Ten Years' Duration — Pain in the Loin—Repeated Hæmaturia with Cessation of Symptoms for considerable periods after treatment by rest, thereafter followed by Symptoms pointing to Malignant Disease—Calculus and Epithelioma of the Left Kidney.*

A man, aged 56 years, was seen by me first on 12th December, 1884, and at that time he gave a history of his illness which clearly pointed to renal calculus in the left kidney. He said that about ten years ago he began to suffer from a dull, aching pain in the loin, accompanied by a sense of weight on the affected side when he was occupied at his work, that of a marine engineer. The pain was inconstant, but as a rule it was aggravated by any sudden movements of the body, such as jumping, running, or sudden change of position in bed. The pain also varied with posture; when he lay upon his left side the pain was

relieved, while if he stood, or lay upon his right side it was increased. At this time the abnormal sensations were strictly limited to the left side. Within six months of the onset of the pain he commenced to suffer from frequent micturition, with pain in the bladder, and at the same time he noticed that the urine contained small quantities of blood. The bleeding was usually accompanied by pain, and as a rule it was increased by movements of the body, but sometimes several hours or even days might elapse between the exertion to which it was referred and the appearance of the blood in the urine. The blood was intimately mixed with the urine when passed, but if the urine was allowed to stand for a few hours the blood corpuscles gradually separated as a deposit and left the supernatant urine clear. At this time the urine was acid. The patient was a very intelligent man and I could rely thoroughly upon his statements. He said that the medical men whom he had consulted told him that he suffered from a stone in the kidney, and that they had reported his urine to be free from albumen and pus. The symptoms of renal calculus, after being in abeyance for three years, recurred in 1878. When I saw him in 1884 he was suffering very severely from hæmaturia, together with sharp pain in the left renal region. Considering the history above recorded the diagnosis seemed to me to lie between renal calculus and a stone in the bladder: the general course of the hæmaturia was strongly in favour of the hæmorrhages being renal rather than vesical. I ordered the patient to take rest for a week, and at the end of that time the pain was greatly relieved and the hæmorrhage had almost entirely disappeared, but the urine on examination was found to contain not only blood but also a considerable quantity of albumen and a few tube-casts; these were present in acid urine and could be readily

separated by a centrifugal machine, but the tube-casts did not deposit readily, and if the urine became alkaline they disappeared, probably by solution. The question placed before me by the patient was whether his case was a suitable one for operation or not, and the patient came to me for the special purpose of being informed whether one or both kidneys was diseased, as he had been told by his medical attendant that the urine from each kidney could be examined separately. After some trouble I succeeded in catheterising the ureters, and while I found that all the blood came from the left kidney, the urine from the right kidney contained both albumen and tube-casts. I consequently advised the patient against an operation, but prescribed what I considered suitable treatment for his relief. At this time there was no evidence of tumour in the renal region. The patient was directed to take as much rest as possible, and instructions were given him as to his general health. I did not see the patient again until June, 1885, when he presented himself to report progress. His general appearance was markedly improved, and he told me that for the previous three months he had not observed any blood in the urine, although he suffered from occasional pains in the left renal region. These pains were, however, less frequent and less severe than in the latter months of 1884; still there were no signs of swelling in the loin. The next time I saw the patient was in November, 1886, when I observed a great change in his appearance. He was greatly emaciated, pale, and found a difficulty in walking even a short distance. He told me that he had almost no appetite, and frequently when he took food it was rejected. About four months previously to his last visit to me he had a very severe and prolonged attack of hæmaturia, and sometimes clots were formed which caused obstruction

to the escape of the urine from the ureter or from the bladder. The pain was also more intense and more constant, and instead of being dull and paroxysmal, as in former times, it was now more lacerating and the area of distribution of the pain was greater: instead of being limited to the hypogastrium or the lumbar region, it now extended down the left thigh, across the abdomen, and to the left shoulder. The urine, in addition to tube-casts, deposited large epithelial cells which were bound together more or less by blood-clot. Now for the first time a distinct swelling was observed in the left loin, the tumour could be distinctly felt through the lumbar muscles, and, with one hand in the lumbar region and the other in front, a smooth, solid swelling of about twice the size of an ordinary kidney could be made out. The tumour was firmly fixed and painful on pressure, the percussion in the loin was dull as far as 4½ inches from the spine, and this percussion was not varied by the position of the patient.

The two cases last described are exceptional, the one in the circumstance that a huge malignant tumour developed without giving rise to any characteristic symptoms, and the second in that a renal calculus in the pelvis of the kidney, by producing local irritation, probably induced the formation of an epithelioma. In the great majority of patients suffering from tumour of the kidney, the first warning which the patient receives of the presence of disease is a profuse hæmaturia (see Case XXVII), sometimes induced by slight violence, but in most instances coming on spontaneously: probably the most profuse renal hæmaturiæ are those met with in cases of malignant disease.

Chapter VIII.

RENAL "PHTHISIS AB HÆMOPTOË" FOLLOWING TRAUMATIC HÆMORRHAGE.

Hæmoptyses have long been regarded as occupying an important relationship to pulmonary phthisis, from the circumstance that they often precede the more evident symptoms and physical signs of the disease. Since early times, pathologists have differed in their opinions respecting the etiological importance of such bleedings. One class of observers have regarded the effusion of blood as the origin of the tuberculosis, and distinguished it by the old term, "phthisis ab hæmoptoë." Others have supposed this explanation to be based upon inadequate foundations, and have held to the idea that the hæmorrhages were evidence of the existence of an initial tuberculous lesion, but at the same time they willingly admitted that the occurrence of hæmorrhage may, by providing a suitable nidus, accelerate the progress of the disease. These two conceptions as to the relationship of hæmorrhages to tuberculosis are probably both correct, and certainly are reconcilable with our present knowledge of the etiology and life-history of tuberculous disease. No one, however, can now argue, as was formerly contended, that mere blood infiltration can of itself cause tuberculosis; but, on the other hand, it is now fully admitted that injury is an important influence in determining, not only the localisation, but even the occurrence of tuberculous

disease. Probably the best example of this is found in the disease as it attacks bones and joints. The trauma causes extravasation of blood or of serum, and at the same time weakens the resisting power of the tissues of the part. Even in slight injuries, where there is no perceptible extravasation, the deposit and multiplication of tubercle bacilli may be favoured by the simple disturbance of the circulation, associated with the processes of repair. Indeed, the onset of the malady is seldom attributed to severe blows on bones or strains of joints, but rather to very slight injuries, which in the first instance attract little attention. It is probable that these slight traumatisms, by depressing the resisting power of the tissues, not only provide a suitable nidus for the implantation of the bacilli, but also supply a pabulum in which they multiply. It is also well known that the employment of force, in rectifying the deformities of bones or of joints, may lead to a fresh outburst of the disease.

Two conditions are necessary to the establishment of tuberculous disease in the kidney—the presence of a suitable nidus there, and the conveyance of the specific organisms to the part. The healthy kidney tissue, being very vascular, has a remarkable power of destroying tubercular organisms introduced into its substance, or of eliminating them from the system. To discuss how this is brought about is beyond the scope of the present inquiry. But an important clinical fact must here be referred to, viz., that tubercle bacilli, which are carried by the blood from distant parts, may be eliminated without any morbid change in structure being produced, in evidence of their sojourn through the kidney. For example, tubercle bacilli may be found in the urine of patients suffering from tuberculous disease of the bones, of the lungs, or of other organs. Their presence in the

urine is therefore not pathognomonic of tuberculosis of the urinary tract, and although the observation of these organisms furnishes positive proof that the patient is tuberculous, the precise seat of the lesion remains to be determined. In cases where the kidney eliminates these bacilli without itself being involved in the tuberculous process, as an explanation, it must be assumed either that the quantity which is carried to the organ at a given time is too small, or that the virulence of the microbes is insufficient to overcome the normal preventive power of the renal tissue, and produce a specific pathological effect. The natural power of the renal tissue in destroying micro-organisms, may be rendered less powerful by malformations of the organ or by disease. Hence we find that Bright's disease, cystic degeneration, amyloid degeneration, displacements, or congenital malformations, all tend to make the kidney more liable to septic and tuberculous diseases; and, as in other organs, so also in the kidney, injury or hæmorrhage may be an exciting cause of tuberculosis. In order that tubercle bacilli may grow and multiply in the kidney, it is necessary that they be conveyed by the blood-stream to a part where there is a favourable soil for their growth, and where they are not liable to be washed away by the current of blood or the flow of urine. Suppose that tubercle bacilli are present in the blood when a blow is sustained by the kidney, then the effused blood, with thrombosis of capillaries, and the injury of the tissues, provide the conditions required. The following cases are illustrations of tuberculous disease of the kidney following injuries sufficiently severe to produce hæmaturia:—

CASE XXXIV.—*History of a Fall of 26 Feet—Severe Pain in the Left Renal Region—Hæmaturia and Effusion of Blood around the Left Kidney—Apparent Complete Recovery from Injury—Two and a Half Years afterwards Suffering from Advanced Tubercular Disease of the Left Kidney.*

A man, aged 30 years, was admitted into the Glasgow Royal Infirmary on 11th May, 1893. The patient was working on the deck of a steamer when he accidently fell into the hold, a distance of 26 feet. He was rendered unconscious, and when admitted to the hospital was suffering from severe shock. Besides other injuries, he complained of severe pain in the left lumbar region, and the first urine passed after admission contained a considerable quantity of blood. On examination, a distinct fulness and increased resistance were made out in the left flank, and over this area the percussion was dull. The patient made a slow but steady recovery, but he was detained in hospital until 17th August on account of the other injuries, the kidney condition having apparently been recovered from within a fortnight. The hæmaturia disappeared ten days after admission. The man was again seen on 27th November, 1895—two and a half years after the accident—by Dr. D. M'Kellar Dewar, who recommended him to go into the hospital, but this he refused to do, preferring to be under the care of his private medical attendant, with whom the writer saw him in consultation. The patient stated that he remained well, and was able to follow his occupation, until the end of May, 1895, when he complained for the first time of a recurrence of the pain in the left lumbar region, and although on palpation a distinct fulness could be made out, no fluctuation was detected. The urine was free from any deposit, blood, or albumen. Tubercle bacilli were not looked for. In November the urine contained an abundant muco-purulent

deposit, six specimens of which were examined for tubercle bacilli, and in two of these bacilli were found. From May to November the patient's general health rapidly deteriorated, his appetite was impaired, and he lost 16 lb. in weight. The evening temperature was elevated irregularly and he complained of night-sweats, but there was no vesical irritation. By the end of December a distinct fluid accumulation was discovered in the left kidney, and the patient was advised to have a nephrotomy performed, when the kidney was found to be occupied by a typical tuberculous pyonephrosis.

CASE XXXV.—*History of a Blow causing Ecchymosis in the Right Lumbar Region—Hæmaturia of Five Days' Duration, with one Recurrence on the Eleventh Day—Severe Pain and some Swelling in the Right Renal Region—Six Months after the Injury the Urine became Muco-purulent and Bloody—Symptoms and Physical Signs of Renal Phthisis.*

A woman, aged 47 years, was admitted into the Glasgow Royal Infirmary on 2nd August, 1895. On inquiry, it appeared that in January the patient fell from "house steps," a distance of 8 feet, and on falling struck her "right side" against the back of a chair. The blow was received on the right lumbar region, and it caused considerable ecchymosis between the lower ribs and the crest of the ilium. On recovering from the immediate shock of the injury she suffered from severe deep pain in the region, and the urine which was first passed after the accident contained blood. The hæmaturia continued for five days after the injury, and recurred only once on the eleventh day. There was some swelling in the region of the kidney, but how long it lasted the patient did not know. Since the fall the "side" had always felt weak, but the pain was not severe till seven

weeks previous to admission to the infirmary, and about the same time she observed the urine to be dark in colour, and that it contained blood together with a white deposit. On admission the patient complained of a swelling in the right lumbar region. She had always been rather spare in body and lacking in colour, but she said that she had fallen off considerably of late. About a month previous to admission she had pain in the lumbar region whenever she moved about, and at the same time the urine presented the abnormal appearance above mentioned. On examination, the whole space between the liver and the crest of the ilium was dull and fluctuant, and presented the characteristic features of a large pyonephrosis, but there was no sudden discharge of purulent urine at any time. The specific gravity of the urine was 1012, it was strongly alkaline and contained a considerable quantity of pus, some blood, and crystals of oxalate of lime; tubercle bacilli were also numerous. On 17th August the kidney was excised, when a large quantity of pus, urine, and tubercular *débris* was evacuated, and a large cavity was scraped out with a Volkmann's spoon. Later in the history of the case the lungs became involved, there being dulness and abundant moist râles at the bases of both lungs behind, but at the apices there was no evidence of consolidation.

In each of these cases it was clearly shown by the history that the patients enjoyed perfect health until the occasion of the injury, and it may be safely presumed in both instances that the traumatism was the only cause of the hæmorrhage. In cases where slight indirect violence has been followed by the appearance of blood for the first time, the question may be legitimately raised as to the presence of pre-existing disease, which may not, up to the time of the

accident, have shown itself by hæmaturia. But in these cases the blows were severe and direct, and sufficient to injure the kidney. The most reasonable explanation seems to be that the injury reduced the resisting power of the organ, and at the same time caused an effusion of blood into its substance; that tubercle bacilli were present in the effused blood, or were conveyed to the neighbourhood of the effusion later, took root and multiplied, and formed the centre of infection, and thus produced what may be called a renal "phthisis ab hæmoptoë."

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